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The scientific publications of the National Museum include two series, known, respectively, as *Proceedings* and *Bulletin*.

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The present volume is the sixty-ninth of this series.

The *Bulletin*, the first of which was issued in 1875, consists of a series of separate publications comprising monographs of large zoological groups and other general systematic treaties (occasionally in several volumes), faunal works, reports of expeditions, catalogues of type-specimens, special collections, and other material of similar nature. The majority of the volumes are octavo in size, but a quarto size has been adopted in a few instances in which large plates were regarded as indispensable. In the *Bulletin* series appear volumes under the heading *Contributions from the United States National Herbarium*, in octavo form, published by the National Museum since 1902, which contain papers relating to the botanical collections of the Museum.

Alexander Wetmore,
Assistant Secretary, Smithsonian Institution.

Washington, D. C., *June 25, 1927.*

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A NEW SPECIES OF FLUKE, PARAMETORCHIS NOVEBORACENSIS, FROM THE CAT IN THE UNITED STATES

By See-Lü Hung

Of Peking, China

The material upon which this paper is based was received by Dr. Maurice C. Hall, of the Bureau of Animal Industry, United States Department of Agriculture, from Ithaca, N. Y., and was turned over to me for study. The collection consists of three specimens of a fluke, unstained and mounted on slides in glycerine jelly. It has been necessary to demount, stain, and remount two of the specimens in order that certain portions of the internal anatomy might better be seen. Even so, owing to the masses of eggs in the uterus, it has been impossible for me to determine the exact position of the acetabulum and genital pore. I wish to thank Doctor Hall for the loan of the material and Dr. E. A. Chapin for kind assistance.

The new fluke is much like *Parametorchis complexus* (Stiles and Hassell). As the type specimen of *P. complexus* is available for study, I have made a careful comparison of the two forms and have noticed the following differences: The pharynx in the new species is wider than long, whereas in *P. complexus* it is longer than wide. In *P. complexus*, the intestinal branches are strongly flexuous, in the other nearly straight. The testes are nearly simple in the new species instead of being markedly lobulate. The vitellaria are connected at their anterior extremities across the dorsal aspect in *P. complexus;* in the new species there is no trace of such a commissure. Lastly, the eggs are larger in the new species than in *P. complexus*. Because of these differences I believe that these specimens represent a species new to science and I propose that it shall be called *Parametorchis noveboracensis.*

PARAMETORCHIS NOVEBORACENSIS, new species

Specific diagnosis.—Length 6-6.3 mm.; breadth 2.2-2.6 mm.; body linguiform, anterior end pointed, posterior end round. Cuticle covered with spines. The preserved specimens are straw-color. The

oral sucker varies in width from 232μ to 242μ. The pharynx is immediately behind the oral sucker and is broader than long. Its width varies from 281μ to 300μ, its length from 232μ to 242μ. The esophagus is very short. The intestinal branches extend to the posterior extremity of the body. The testes lie in the posterior half of the body, one in front of the other. The posterior testis is slightly lobate, while the anterior testis is nearly round. The ovary is composed of three or four lobules and is about 400μ long. Posterolateral to the ovary is situated the pyriform receptaculum seminis. The vitellaria are in the anterior half of the body only and lie almost entirely outside of the intestinal branches. The right gland is from 2.2 mm. to 2.3 mm. long. The left gland is a little shorter, about 2 mm. to 2.2 mm. long. The uterus is rosette-shaped, and is situated in the anterior half of the body. The excretory canal is a sigmoid lying between the testes and ending just back of the uterine complex. The eggs average 28μ to 32μ long by 15μ to 18μ wide.

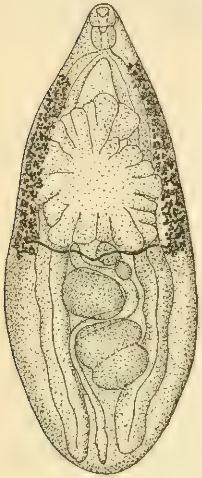

FIG. 1.—PARAMETORCHIS NOVEBORACENSIS

Type.—U.S.N.M. Helminthological Collection, No. 26628, paratype No. 26629.

Host.—*Felis domestica.*

Locality.—New York (Ithaca).

Location.—Gall bladder.

LITERATURE CITED

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THE OPTICAL PROPERTIES AND CHEMICAL COMPOSITION OF GLAUCONITE

By Clarence S. Ross
Geologist, United States Geological Survey

INTRODUCTION

Glauconite has long been a subject of study by mineralogists, by students of sediments, and by those interested in modern marine deposits. It is a mineral that has formed in every geologic age from the Cambrian to the present, and the related mineral greenalite is found in pre-Cambrian rocks.[1] Beds of nearly pure glauconite with wide lateral extent are not uncommon and it occurs in varying proportions in almost all types of sediments. Glauconite is one of the important materials now forming on the sea bottom, and the potassium content makes it a possible source of plant fertilizers. All this has inspired many studies of glauconite and much literature has accumulated on the subject, but nevertheless there has been little agreement as to the exact chemical composition of glauconite and its optical properties are but imperfectly known. The incomplete understanding of glauconite has led to the present study which includes a determination of the optical properties of material from several localities, and an investigation of the chemical relationships which appears to satisfactorily explain the variation in chemical composition.

OCCURRENCE OF GLAUCONITE STUDIED

In 1915 L. A Myllius brought to the attention of the writer a mineral from the lead mines of southeastern Missouri that had long been called " chlorite " or " chloritic material,"[2] and on investigation this proved to be glauconite.[3] Additional material was secured from some of the mining companies and Doctor Buehler, the State Geologist of Missouri. Diamond drill cores furnished by the St. Joseph Lead Co. contained some unusually good material, and this led to a thorough study of the Missouri glauconite. The

[1] Leith, C. K., U. S. Geol. Survey Mono., vol. 43, 1903, pp. 239–259.
[2] Buckley, E. R., Mo. Bur. Geol. Mines, vol. 9, pt. 1, p. 28, 1909.
[3] Ross, C. S., Econ. Geol., vol. 11, pp. 289–290, 1916.

glauconite of southeastern Missouri occurs in the Bonneterre dolomite of Upper Cambrian age, and is intimately associated with the lead ore, and locally forms 50 per cent or more of the rock. The grains vary in size and shape, and the relations to the inclosing rock have possibly been modified by recrystallization of the dolomite. The type of glauconite which is most abundant forms loose aggregates that commonly occur as more or less rounded grains. Another type forms wedge-shaped areas that are sharply bounded by euhedral dolomite crystals. Some of the glauconite in diamond drill cores from the St. Joseph Lead Co. mines forms small compact grains about 0.2 millimeter in diameter in dolomite and associated with a little detrital quartz. The individual grains of all these types are never truly amorphous and they leave no doubt of their crystalline character. They are composed predominantly of the fine grained aggregates of overlapping crystal plates that are characteristic of nearly all glauconites, but a large proportion of the grains in the compact type of glauconite from the St. Joseph Lead Co.'s drill cores are single crystal individuals, and an occasional grain of the other types shows this property.

A very careful study of the greensands of New Jersey has been made by Doctor Mansfield,[4] of the United States Geological Survey, who describes and figures glauconite grains, each of which is a single crystalline individual. Some of the New Jersey material was placed at the disposal of the writer by Doctor Mansfield and the optical properties of this glauconite have been determined.

Glauconite occurs in the bentonitic horizon of the Ordovician of Tennessee, Alabama, and Kentucky that has been described by Nelson.[5] At Singleton, Tenn., it is associated with quartz, feldspar, muscovite, and the claylike mineral, montmorillonite, that is characteristic of bentonite. A few of the glauconite grains have the structure of the usual cryptocrystalline aggregate, but a majority of them are single crystal individuals. Some crystals of glauconite lie between the lamellae of muscovite plates, and others are imbedded in montmorillonite crystals, and crystals of glauconite are often in parallel orientation with muscovite and montmorillonite.

Glauconite has also been studied from several other localities with determination of the optical properties. Individual crystals of glauconite were found after careful search in almost every sample studied, but sometimes hours of patient search were required before such a single individual was found.

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[4] Mansfield, G. R., Econ. Geol., vol. 15, pp. 547–566, 1920, U. S. Geol. Survey Bull. 527, 1922.

[5] Nelson, Wilbur A., Geol. Soc. America, Bull., vol. 33, No. 3, pp. 605–615.

Most of the grauconite no doubt forms on the sea bottom in the manner commonly accepted,[6] but this method of origin can not apply to all occurrences. Glauconite is frequently observed that has formed in the cleavage cracks of other minerals, and also where it has partly or wholly replaced both silicates and carbonates. It is evident that glauconite has formed from solutions by direct precipitation and by replacement of preexisting minerals, and in many occurrences subsequent to the deposition of the inclosing sediments.

OPTICAL PROPERTIES

The glauconite from the Bonneterre dolomite, St. Joseph Lead Co. mines near Bonneterre, St. Francis County, Mo., is more completely crystalline and shows the optical properties more perfectly than any other material that has been observed. For this reason it will be described in detail and the other types of glauconite will be compared with it.

The grains of glauconite that occur as single crystals vary in habit. Some have perfect, parallel cleavage and are rectangular in the plane perpendicular to the cleavage and more or less rounded in a plane parallel to the cleavage. A few suggest a roughly hexagonal outline parallel to the cleavage but no completely euhedral crystals of glauconite have been observed. Part of the grains have a curved helminth-like habit and the cleavage is radial, and others have a core that represents a single crystal surrounded by a fine grained aggregate of crystal grains. The better crystals have a very perfect cleavage, a strong pleochroism from bright green to yellow, and a moderately high birefringence. Glauconite is therefore similar to the micas in habit.

The indices of refraction of glauconite from the Bonneterre dolomite of Bonneterre, Mo., are $\alpha=1.597$, $\beta=1,618$, $\gamma=1.619$, $\gamma-\alpha=.022$, $\pm.003$. Optical character negative $(-)$. The acute bisectrix X is nearly, but not quite normal to the cleavage. X inclined to C about 3°. The absorption is $Z=Y<X$, Pleochroism Z and Y lemon yellow, X dark bluish green (dark Russian green of Ridgeway). The optical angle is nearly constant with $2\ V=20°$, $2\ E=33°$. The dispersion is distinct $\rho>v$, but the absorption of the red by the blue-green mineral makes it very difficult to observe.

The other types of glauconite that have been studied show the same properties in somewhat less perfection of detail. The glauconite from Singleton, Tenn., contains a very large proportion of grains that are individual crystals. These have the same general habit as those just described, but the color is very pale yellow to pale green. The largest optical angle observed ($2V=30°$) is that of the glaucon-

[6] Challenger Rept., Deep-sea deposits, 1891, p. 383.

ite from Woodstown, N. J. The optical properties of the glauconites studied are given in the following table:

TABLE I.—*Optical properties of glauconite*

	Optical character	Cleavage 001	Indices of refraction			$\gamma-\alpha$	2 V	2 E
			α	β	γ			
1. St. Francis Co., Mo	(−)	Good	1.597	1.618	1.619	0.022	20°	33°
2. Woodstown, N. J	(−)	Good	1.612	1.629	1.630	.018	30°	50°
3. Singleton, Tenn	(−)	Good	1.590	1.609	1.610	.020	20°–23°	33°–37°
4. Piscataway, Md	(−)	Good	1.590	1.614	1.615	.025	24°	38°
5. Cambrian of Minn	(−)	Good	1.612	1.643	1.644	.032	19°	31°
6. Tampico, Mexico	(−)	Good	1.610	1.629	1.630	.020	22°	35°
7. Black Hills, S. Dak.[a]	(−)	Good	1.610	1.629	1.630	.020	20°	33°
8. Patuxent Quad., Md., near Croom.	(−)	Good	1.591	1.615	1.616	.025	16°	24°
9. Huntington, Oreg	(−)	Poor	1.59		1.62	.03	20°–40°	30°–60°

[a] Crystal individuals are very rare and the determinations are only approximate.
(1) Glauconite from St. Joseph Lead Co. mine, near Bonneterre, St. Francis County, Mo. Upper Cambrian age.
(2) Glauconite from Woodstown, N. J. Cretaceous age.
(3) Glauconite from Singleton, Tenn. Ordovician age.
(4) Glauconite from Piscataway, 2 miles southeast of Fort Washington, Md. Cretaceous age.
(5) Glauconite from Cambrian, of Minnesota, locality unknown.
(6) Glauconite from Cretaceous of the Tampico oil district, Mexico.
(7) Glauconite from Cambrian of Deadwood, S. Dak.
(8) Glauconite from near Croom, Patuxent Quad., Md.
(9) Glauconite from Huntington, Oreg.

The mineral from Huntington, Oreg., was a mineral specimen submitted to the Geological Survey for identification and the exact nature of its occurrence is not known. It forms large compact masses of an earthy texture. In thin section it resembles massive serpentine, with large poorly defined, smearlike areas of birefracting material. No sharply defined crystals were observed and the cleavage is not well developed. The chemical composition, which is represented by analysis 13 (Table II) differs from typical glauconite only in being low in RO bases. The indices of refraction are $\alpha=1.59$, $\beta=1.62\pm.005$, the axial angle is variable, 20°–40°, optical character (−). Thus the chemical composition and optical properties are those of glauconite, but the habit and structure are different from those of any previously described glauconite.

CHEMICAL COMPOSITION

The number of good analyses of glauconite is not large and many of those published are worthless, because in most of the older analyses iron has been determined in only one form of oxidation, because very impure material has frequently been used for analysis, and because methods of purification have frequently been faulty. Glinka[7] gives a number of analyses of Russian glauconites, but the results indicate that some of the material was very impure and some of the analyses show an unusually high content of potash. Sonstadt's

[7] Glinka, K., Zeitschr. Kryst, Min., vol. 39, 1899, p. 390 (abstract from Russian original).

heavy solution (potassium iodide and mercury iodide) was used in the separation of the glauconite, and since this mineral exchanges bases so readily that it can be used as a water softener, it is probable that the original potassium content was considerably augmented. On account of the possible error in potash content all of Glinka's analysis have been rejected, though some of them may undoubtedly be good.

Glauconite of undoubted purity contains very little calcium, and in fact there is commonly only enough calcium to combine with phosphorus when carbonates are completely absent. Silica is always low where calcium is high, and it is evident that calcium is present as an impurity, probably as calcite and possibly as gypsum in some specimens. For this reason all analyses that contained 1 per cent or more of calcium oxide (CaO) have been rejected and the calcium in the analyses used has not been included among the essential bases in the derivation of the chemical formula.

The analyses of glauconite that have been made on the best material usually contain only small proportions of sodium, but it has been suggested[8] that there may be a sodium form of glauconite. This the writer is unable to confirm or disprove, but 3 analyses containing over 1 per cent of sodium oxide (Na_2O) have been included in the tables.

The modern glauconites dredged from the sea bottom are fine-grained and earthy and so their purification for analysis has been very difficult. The analyses of three such specimens have been deemed good enough to be used in the chemical interpretation of glauconite, but most of those given in the literature were obviously made on very impure material. In Table II are listed 17 analyses that appear to be good enough to be used in an interpretation of the chemical composition of glauconite.

As a first step in interpreting these analyses Al_2O_3 was combined with Fe_2O_3, FeO with MgO, Na_2O with K_2O, H_2O was left out of consideration for the time being, and small amounts of P_2O_5, CaO, etc., were disregarded as they no doubt form impurities. The composition was then recalculated to 100 per cent and Fe_2O_3, MgO, and K_2O plotted on a three component diagram (not reproduced here). The ratio between K_2O and SiO_2 is constant and so the relations were not obscured by neglecting SiO_2 for the time being and thus the failure to plot four interdependent variables. The dots representing composition fell along a fairly straight line and it was evident that glauconite contains only two components or end members. The analyses that were inferior were also plotted and proved to be fairly close to the line of ideal composition and even those that were very poor indicated no systematic variation from the ideal.

[8] Hallimond, A. F., Mineralogical Magazine, vol. 19, No. 98, pp. 332–333, 1922.

One of these end members is evidently composed of $R_2O:RO:$-$R_2O_3:SiO_2$ in the ratios 1:2:2:10 and the variation in composition was toward a second end member where $R_2O:RO:R_2O_3:SiO_2=$ 1:1:3:10. All the analyses of glauconite given in Table II and also the analyses that were rejected for various reasons lie between these two end members, but there is a possibility of a wider range of composition as the chemical relationships permit variation between 1:3:1:10 and 1:0:4:10.

The ratio of K_2O to SiO_2 is approximately 1 to 10 as the average for all analyses used is 1 to 9.7.

The chemical composition of the ideal end members as just obtained and the analyses of glauconite have been graphically plotted on two coordinates in Figure 1. The elements that isomorphously replace one another have been combined as previously described and recalculated to 100 per cent so that only K_2O, MgO, Fe_2O_3, SiO_2, and H_2O are considered. Water was included in the calculations but was not plotted as its line is very close to that of MgO and thus involved an overlapping of points.

The black dots in Figure 1 represent end members and the circles represent analyses. The vertical coordinate on the diagram shows the chemical composition in per cent, and the horizontal coordinate the proportion of the two end members. Thus the chemical composition of a glauconite is represented graphically by four circles lying on a single vertical line, the upper one being SiO_2, the next R_2O_3 recalculated as Fe_2O_3, the next R_2O recalculated as K_2O, and the lowest RO recalculated as MgO. The departure from the theoretical composition is shown by the distance of the circles from the curve, and where the analyses exactly conform to theory the circles fall directly upon the curve. With few exceptions the circles fall very close to this ideal line and the analyses thus plotted represent so consistent a series that it seems evident that the end members have been correctly deduced. It will be seen that MgO decreases as Fe_2O_3 increases; that SiO_2 decreases in per cent, but not in ratio as Fe_2O_3 increases; and that the ratio of K_2O to SiO_2 is constant.

The same relationships are shown numerically in Table II. The three component diagram was used to determine the proportion of the two end members represented in each glauconite analysis. An ideal composition based on this deduced proportion was then calculated for each analysis given in the table, and the column immediately following the analysis gives the ratio of this ideal composition to the actual composition. Thus 100 represents exact agreement of an element in the analysis with the assumed proportion, and a departure from 100 shows a failure of the element to conform to the ideal composition. If an analysis conformed exactly to theory, 100 would

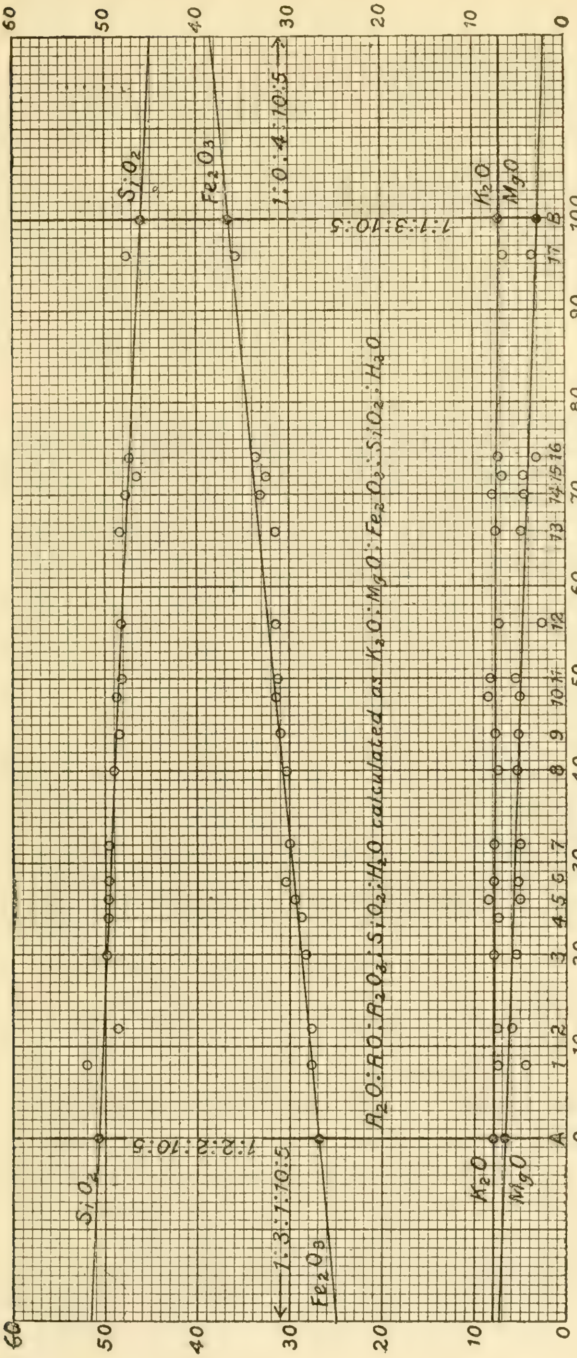

FIG. 1.—GRAPHIC PRESENTATION OF GLAUCONITE ANALYSES SHOWING VARIATION IN COMPOSITION BETWEEN END MEMBERS

follow SiO_2, Fe_2O_3, K_2O, and MgO. The number at the head of the column of ratios shows the proportion of the end members in the make-up of that analysis.

The analyses of glauconite given in the table have been compiled from various sources and the water has not been determined under similarly controlled conditions, and in most of them it has not even been determined separately below and above 100°. For these reasons they give no reliable evidence of the part water plays in the composition of glauconite. However, the water content of the unusually pure glauconite from the Bonneterre dolomite of Bonneterre, Mo., has been carefully determined for different temperatures in the chemical laboratory of the United States Geological Survey, and the dehydration curve is given in Figure 2.

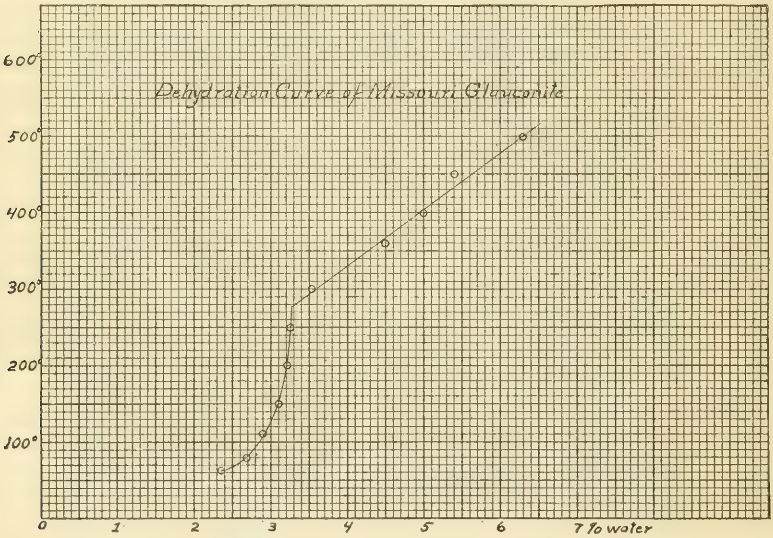

FIG. 2.—DEHYDRATION CURVE OF MISSOURI GLAUCONITE.

There is a sharp break in the curve at 280° and below that temperature about 3.30, and above about 3.26 per cent of the water is given off, the total water in the sample being 6.56 per cent of the whole. There is good reason for believing that the water above this sharp break is constitutional and below is water of crystallization or adsorbed water. ($2H_2O$) seems to represent the constitutional water in the formula for glauconite, since that amount would demand 3.06 per cent, and since the ratio of theoretical water to water given off about 280° is 3.06 to 3.26 or 1.06. Glauconite is a finely micaceous mineral and minerals of this type adsorb water freely. For this reason it is probable that the water given off below 280° is adsorbed water and not water of crystallization. The total water in glauconite is somewhat variable, but the average is about $5H_2O$.

The foregoing considerations indicate that the chemical composition of glauconite can be completely explained if it is considered to be an isomorphous mixture of two end members with the formulas

$$(A) = 2H_2O \cdot K_2O \cdot 2(MgO, Fe''O) \cdot 2(Fe_2'''O_3, Al_2O_3) \cdot 10SiO_2 + 3H_2O$$

and

$$(B) = 2H_2O \cdot K_2O \cdot (MgO, Fe''O) \cdot 3(Fe_2'''O_3, Al_2O_3) \cdot 10Si\ O_2 + 3H_2O$$

The two formulas are nearly identical, the only difference being that in (A) there is 2MgO instead of 1MgO as in (B), and this is compensated for by there being 1 Fe_2O_3 less in (A) than in (B). These formulas may be written in several different forms as follows:

$$(A) = 4H \cdot 2K \cdot 2Mg \cdot 4Fe''' \cdot 10Si \cdot 31O + 3H_2O$$

and

$$(B) = 4H \cdot 2K \cdot Mg \cdot 6Fe''' \cdot 10Si \cdot 33O + 3H_2O$$

There is an excess of but one oxygen over the 1 to 3 ratio of the silicic acid, and in order to make this compound a metasilicate this oxygen can theoretically be combined only with the ferric iron so that the formulas may be written:

$$A = 4H \cdot 2K \cdot 2Mg \cdot [Fe'''O]' \cdot 3Fe''' \cdot 10[SiO_3] + 3H_2O$$

and

$$B = 4H \cdot 2K \cdot Mg \cdot 3[Fe'''O]' \cdot 3Fe''' \cdot 10[SiO_3] + 3H_2O$$

TABLE II.—*Analyses of glauconite*

	A	1		2		3		4		5		6		7		8		9	
	100 : 0	92 : 8		88 : 12		80 : 20		76 : 24		74 : 26		72 : 28		68 : 32		60 : 40		54 : 44	
SiO_2	50.63	50.62	1.08	49.76	0.97	49.47	0.99	50.70	0.95	50.58	1.00	51.15	1.00	50.36	1.01	51.24	1.00	49.42	0.97
Al_2O_3		3.80		8.18		5.59		19.80		6.72		7.61		7.04		12.22		10.23	
Fe_2O_3	27.06	21.03	.90	16.00	1.00	19.46	.97		1.00	19.50	1.00	18.83	1.00	19.13	1.00	13.44	1.01	16.01	1.00
FeO		6.02		3.77		3.36		8.60		2.96		2.78		3.95		3.06		3.00	
MgO	6.76	[1] 0.57	.76	3.97	.93	3.96	.96	3.70	1.32	4.10	.97	4.54	1.01	4.08	1.11	3.93	.99	3.78	.97
CaO		[1] 0.54		0.41		0.60				0.34				0.91		0.10		0.31	
Na_2O				0.52		0.16		0.50		0.04				1.58		0.31		0.26	
K_2O	7.94	7.14	1.00	7.57	1.03	8.04	1.04	8.20	1.02	8.26	1.05	7.80	.98	6.62	.97	7.50	.96	7.91	1.03
H_2O- H_2O+	7.60	9.14		9.82		8.54		8.50		7.76		7.56		6.32		8.20		8.08	
Total		98.86		100.00		[2] 100.80		100.00		[3] 100.83		100.27		[4] 100.34		100.00		[5] 99.80	

	10		11		12		13		14		15		16		17		B
	52 : 48		50 : 50		44 : 56		66 : 34		30 : 70		28 : 72		26 : 74		4 : 96		0 : 100
SiO_2	49.23	1.00	48.66	0.98	48.12	1.01	49.05		47.46	1.00	49.09	0.97	46.90	0.99	49.12	1.02	46.01
Al_2O_3	7.11		8.46		9.16		19.66		1.53		15.21		4.06		7.09		
Fe_2O_3	20.89	1.00	18.80	.99	19.10	.98	7.96		30.83	1.00	10.56	.96	27.09	1.00	25.95	1.00	36.81
FeO	3.06		3.98		3.47		0.75		3.10		3.06		3.60		0.89		
MgO	3.44	.99	3.56	1.10	2.36	1.06	1.17		2.41	.95	2.65	.95	0.70	.64	3.10	.98	3.07
CaO	Tr.		0.62		0.76		2.34				0.55		0.20				
Na_2O	0.11		None.		0.22		6.18				1.21		1.28				
K_2O	8.51	1.10	8.31		7.08	1.01	0.78		7.76	1.04	6.05	.73	6.16	.95	7.02	.93	7.21
H_2O-	1.83		1.94	1.07	10.06		11.79		7.00		11.64		9.25		7.12		6.90
H_2O+	4.88		4.62														
Total	99.06		[6] 99.08		100.33		99.68		100.09		100.02		99.24		100.29		

[1] Carbonates.
[2] Including P_2O_5=1.06; CO_2=0.56.
[3] Including P_2O_5=0. 27; CO_2=0.30.
[4] Including TiO_2=.02; P_2O_5=. 26; MnO=.06; Li_2O=.01.
[5] Including Insol.=.80.
[6] Including CO_2; H_2O above 280°=3.26; below 280°=3.30; P_2O_5=0.12; MnO=0.01, CO_2.
A. Ideal End Member.
1. Havre, France, Haushofer, K., Journ. prakt. Chemie, vol. 102, p. 38, 1886.
2. Grodno, Poland, A. Kupffer, Archiv Naturk. Liv-, Ehst- und Kurlands, ser. I, Min. Wiss. Dorpat, 1870, vol. 5, p. 123.
3. G–13C. Elmwood Road, N. J., Mansfield, G. R., Econ. Geology, vol. 15, No. 7, p. 557, 1920.
4. Island Orleans, Quebec, Hunt, Geol. of Canada, 1863, p. 487.
5. G–7C. Sewell, N. J., Econ. Geology, vol. 15, No. 7, p. 557, 1920.
6. Agulhas Bank, South Africa, at 110 Fathoms. W. A. Caspari, Proc. Roy. Soc. Edinburgh, 1910, vol. 30, pp. 364–373.
7. Monte Brione, Lake Garda, Italy, Sitzungsb. Akad. München, vol. 26, 1896, p. 545.
8. Karya-Oro, Ontika, Esthonia. A. Kupffer, Archiv Naturk. Liv-, Ehst- und Kurlands, ser. I, Min. Wiss. Dorpat, 1870, vol. 5, p. 123.
9. Svir River, Olonets, Russia. (Also quartz 0.80.) A. Kupffer, Archiv. Naturk. Liv-, Ehst- und Kurlands, ser. I, Min. Wiss. Dorpat, 1870, vol. 5, p. 123.
10. Big Goose Canyon, 15 miles S. W. of Sheridan, Bighorn Mtns., Wyo. George Steiger, analyst, U. S. Geological Survey, Bull. 591, 1915, p. 340.
11. St. Joseph Lead Co. mines, St. Joseph, Mo. U. S., Geol. Surv. Chem. Lab. Glenn V. Brown, analyst.
12. Lewes, Sussex. E. G. Radley, Mineralogical Mag., vol. 19, 1920–1922, p. 331.
13. Huntington, Oregon. E. P. Henderson, analyst.
14. Challenger office, described by L. N. Collet ("Les Depots Marine") Encyclopedie Scientifique, p. 167, Paris, 1908.
15. Ashgrove, Elgin, Scotland. M. F. Heddle, Trans. R. Soc. Edinburgh, 1879, vol. 29, p. 79.
16. Agulhas Bank, South Africa, C. W. von Gumbel Sitzungsber, math.-physik, Cl. Akad. Wiss. München, 1886, vol. 16, pp. 417–449.
17. Pacific Ocean, off Panama, at depth of 556 fathoms. W. A. Caspari, Proc. Roy. Soc. Edinburgh, 1910, vol. 30, pp. 364–373.
B. Ideal End Member.

PREVIOUS STUDIES OF GLAUCONITE.

The complete crystallinity of glauconite has been widely recognized. Lacroix [9] described crystal grains and gives the optical properties as follows:

Form and mode of occurrence.—Glauconite occurs in the form of rounded grains similar to grains of powder; they are rarely greater than 0.1 mm. in diameter. The masses of glauconite which form true beds in certain sedimentary horizons are formed by small granules of the nature of agglomerates with or without calcite or marly material. The crystallinity of glauconite is visible only under the microscope and often only with the strongest magnification; when the mineral shows the form of overlapping plates. More rarely one may observe true crystals of glauconite which may reach a fraction of a millimeter in size and be formed entirely of plates or a piling up of lamellae which are probably hexagonal; the latter are often warped after the manner of a variety of ripidolite, helminth, or of kaolinite. These are the crystals that lend themselves to a study of the optical properties.

Cleavage.—Cleavage *p.* (001) analogous to that of the micas and chlorites.

Color and luster.—Olive green, dark green. By alteration becomes more or less a deep yellow.

Appearance.—Earthy. Transparent in thin section and more or less of a deep green.

Optical properties.—The negative acute bisectrix is more or less normal to the perfect cleavage.

$$2E = 30° \text{ to } 40°$$

Sometimes glauconite is nearly uniaxial (Saint-Laurent var.).

The birefringence is probably not determinable with great precision. However, in sufficiently thin plates I have been able to ascertain that it is approximately $n_g - n_p = 0.020$.

By analogy with the micas and chlorites one may suppose that glauconite is monoclinic. I have obtained in a few sections which were almost perpendicular to the cleavage, extinction angles of 1° or 2° with the trace of the perfect cleavage, but it is hardly possible to draw exact conclusions because the orientation of the sections examined is in doubt.

The most thorough microscopic study of glauconite ever made is that by Cayeux.[10] He finds that the great majority of the grains of glauconite are characterized by a cryptocrystalline structure, but he describes and pictures glauconite grains with strong pleochroism and cleavage similar to that in micas or chlorites.

Cayeux agrees with Lacroix as to the probable crystal habit of glauconite.

Caspari [11] has made a study of glauconite now forming and has the following to say of the state of aggregation of glauconite:

Owing to the birefringence and pleochroism exhibited by submarine glauconite when examined under the microscope, it has hitherto been usual to

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[9] Lacroix, A., Mineralogie de la France et de ses Colonies, vol. 1, Premier, pp. 406, 407, 408, 1893–1895.

[10] Cayeux, Lucien, Etude Micrographique des Terrains Sedimentaries, ch. 4, pp. 163–184, 1897.

[11] Caspari, W. A., Proc. Roy. Soc. Edinburgh, 1910, vol. 30, pp. 364–373.

regard glauconite as a crystalline mineral; indeed, Collet and Lee definitely relegate it to the monoclinic system. Against this we have to set the fact that in the submarine mineral, whether granular or pulverulent, nothing in the least like a crystal-contour has ever been noted. It is true that fossil "glauconites," embedded in continental formations, have been from time to time described, which are morphologically as well as optically crystalline. These, however, cannot be accepted as identical with recent submarine glauconite, though they may perhaps be metamorphic derivatives of it; in the absence of analyses it is not unlawful to suspect that some of them may be a quite distinct mineral, possibly chlorite.

On the other hand, certain properties of glauconite indicating a state of aggregation differing from that of ordinary crystalline minerals have been referred to above. Some additional light is shed on this point by the behavior of glauconite as regards hydration. It is a peculiarity of colloid minerals (e. g. clays) and of zeolites that they absorb somewhat large proportions of water, according to the moistness of the air with which they are in contact, without forming definite hydrates. In order to ascertain whether glauconite falls into this class, a series of experiments was made.

After describing a series of experiments the writer (Caspari) comes to the following conclusions:

Firstly, glauconite becomes a highly hydrated mineral in presence of moist air (whilst still remaining an apparently dry powder). No doubt this is the condition in which it exists in its native element, a third or more of its weight consisting of water. Secondly, it is evident, without drawing up a curve, that the hydration decreases continuously with the tension of aqueous vapour in equilibrium, whence it follows that there are no definite hydrates representing a series of distinct molecular species. Thirdly, there is a marked parallelism as regards hydration between glauconite and red clay.

It is well known that this kind of water absorption, which is especially characteristic of colloids, is also shared by the unquestionably crystalline zeolites. The inference, then, which we may now draw as to the nature of glauconite is that it is certainly not an ordinary crystalline silicate like feldspar or mica, but that it must be either a zeolite or a colloid. As between these two alternatives, it is less easy to decide. The property possessed by glauconite of absorbing dyes is again common to both colloids and zeolites. In favor of the view that glauconite is a colloid, we have the absence of crystal-contours and the ease with which it forms colloidal suspensions and solutions. Evidence of crystalline habit, on the other hand, is afforded by the optical anisotropy of glauconite. To this, however, it may be rejoined that isotropic matter in a state of strain is equally capable of showing birefringence. That glauconite may exist under some such strain seems not unlikely when we consider the structure of glauconite grains, in which the glauconite proper would appear to be inclosed by a network of foreign substance; and the vehemence with which the grains fly into powder under the action of acid and alkaline solutions points in the same direction. On the whole, then, though it would be premature to regard the matter as settled, the probability is that glauconite is essentially a colloidal silicate.

In describing the material he has concentrated Caspari says:[12]

A small proportion of the particles, especially the larger ones, retain the characteristic birefringence of granular glauconite.

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[12] Proc. Roy. Soc. Edinburgh, vol. 30, 1910, p. 367.

All the postulates upon which Caspari bases his conclusions as to the colloidal nature of glauconite are partly or wholly wrong. Clays contain varying proportions of minerals of colloidal size, and in many the amount of colloidal material that can be identified is small.[13] It is quite incorrect to assume that clays are wholly colloidal or even predominantly colloidal as he seems to do when he refers to "colloidal minerals (i. e. clay)." Again colloids are not necessarily noncrystalline, for most colloids are finely dispersed crystalline material. The crystallinity of most colloids has been emphasized by Svedberg who says,[14] "almost all particles in colloids are small crystals," and this is undoubtedly the condition of the alkali and acid treated material investigated by Caspari. Adsorption (the absorption of Caspari) of water is a function of great surface area and does not necessarily denote colloidal form, and a finely divided micaceous material like glauconite has tremendous surface area and thus possesses the structure most conducive to great adsorptive powers, for adsorption is not a property that suddenly springs into existence as soon as the degree of subdivision reaches $100\mu\mu$ which has been set arbitrarily as the upper limit for colloidal size.

Thus Caspari's conclusion that glauconite is a noncrystalline colloid has little to stand upon especially as he chose to disregard properties like pleochroism and birefringence which he observed and recorded, and to base his conclusions entirely upon erroneous postulates and a faulty reasoning. There is nothing in the data cited to indicate that glauconite is not an ordinary crystalline silicate that contains much adsorbed water.

The most thorough chemical study of glauconite that has been published is that by Hallimond,[15] of which the essential parts are given below:

In Table III is given the molecular proportions of 12 analyses of glauconite and a comparision of these ratios leads to the following conclusion:

TABLE III.—*Molecular proportions*

	SiO_2	$Al_2O_3+Fe_2O_3$	$FeO+MgO$	K_2O+Na_2O	R_2O_3+RO
1	1,000	218	182	107	400
2	1,000	243	164	107	407
3	1,000	238	163	99	401
4	1,000	201	166	105	367
5	1,000	263	132	102	395
6	1,000	267	87	110	354
7	1,000	272	188	117	460
8	1,000	263	130	103	393
9	1,000	261	144	106	405
10	1,000	283	106	93	389
11	1,000	225	179	97	404
12	1,000	262	133	98	395

[13] Searle, Alfred B., The chemistry and physics of clays, pp. 263–269, Ernest Been, Ltd., London, 1924.

[14] Svedberg, Theo, Chemical Review, vol. 1, 1924, p. 629.

[15] Hallimond, A. F., Mineralogical Magazine, vol. 19, No. 98, pp. 332–333, 1922.

The proportion of alkalis is remarkably constant, and there is clearly no evidence of the substitution of these by water, or, as was assumed by Clarke, by the magnesia group. There is, however, considerable replacement of potash by soda, * * * , and it may be suggested that the name "soda-glauconite" should be used to distinguish these varieties.

In the groups R_2O_3 and RO the molecular proportions are not constant and do not stand in any simple ratio to the silica and alkalis; the ordinary substitutions of alumina for ferric iron and magnesia for ferrous iron are therefore insufficient to explain the analyses. If, however, the (Fe, Mg)O and $(Fe, Al)_2O_3$ are treated as mutually replaceable, considerable improvement can be brought about. The total for these two groups combined is given in the last column of Table II, and it will be seen that, with the exception of Nos. 4, 6, and 7, the total is constant and in simple ratio to the silica. The ratios so obtained lead to the simple formula

$$R_2O.4(R_2O_3, RO).10SiO_2.nH_2O,$$

the ratio of bases to silica being 1 : 2.

There exists a certain justification for regarding the above substitution as possible, for the only definite hydrate of Fe_2O_3 known to exist is the monohydrate, which may be written $OFeOFe(OH)_2$ resembling $Fe(OH)_2$. The extent of this substitution is not great, the ratio of R_2O_3 to RO lying between the limits 3 : 1 and 1 : 1.

As regards the water, apart from the observation that it does not substitute the solid constituents, there is no information as to the extent to which it is present in definite combination; detailed work on the dehydration would be necessary to throw light on this question, and it has been thought best to omit this from the present paper.

The writer is in substantial agreement with Hallimond as to the chemical composition of glauconite. In fact, most of the present paper was prepared before the publication of Hallimond's paper, and so we have come independently to substantially similar conclusions.

CELADONITE

Only a few analyses of celadonite are available and the mineral appears to be even more difficult to obtain in the pure state than glauconite. For these reasons no trustworthy interpretation of the chemical relations of celadonite can be attempted at the present time. If the analyses are plotted they all seem to fall near the composition curves of glauconite when extended far to the left in Figure 1. Therefore celadonite may possibly be made up of the same or a closely related chemical series.

Celadonite of unusual purity has been collected in Cuba by Hewett and kindly placed at the disposal of the writer for examination. This material has indices of refraction that are nearly the same as those of glauconite, but the habit is fibrous, rather than micaceous as in glauconite. The optical character is very difficult to determine as the acute bisectrix is parallel to the thin fibers, but it is probably (+) rather than (−) as in glauconite. This indicates that celadonite may be distinct from glauconite although it is closely related to it in chemical composition.

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MISCELLANEOUS NEW CHALCID-FLIES OF THE HYMENOPTEROUS FAMILY ENCYRTIDAE

By P. H. Timberlake

Of the Citrus Experiment Station, Riverside, California

The family Encyrtidae is remarkable for its incomparably rich and diverse display of generic characters, in sharp contrast with certain other Chalcidoid families, such as the Pteromalidae, which are much more uniform in both appearance and structure. The number of genera of the Encyrtidae, although now amounting to over 300, will be gradually increased by future work, and the immensity of the group can be appreciated only by those who have had occasion to arrange or study collections of small parasitic Hymenoptera, especially from tropical regions. Only a small amount of work has yet been done on these insects from the Tropics, however, except by Girault in Queensland, Australia, so that doubtless many interesting genera and species await description. The family is also by no means poorly represented in the temperate regions of the globe, and a few species have been recorded even from the Arctic Zone.

In the following pages seven new genera and nine new species are described, seven species of which come from North America or the West Indies, and one species each from Fiji and Victoria, Australia. This material has been reared in small part by myself, but for the most part it has been received for determination at various times and from various sources. Seven of these species were reared from Coccidae, and one was reared from *Sympherobius*, which preys upon Coccidae. The habit of the new species from Fiji is unknown, as the type specimen was not reared.

This paper gives the results of a series of studies made at the Graduate School of Tropical Agriculture and Citrus Experiment Station of the University of California at Riverside, California.

VOSLERIA, new genus

Vosleria is evidently allied to the *Dinocarsis* and *Leptomastix* group of genera, and although running with difficulty in Ashmead's table to the *Leptomastix* or *Ectroma* couplets, it does not agree closely in details with any of the included genera. In Girault's table

it runs to *Ameniscocephalus*, but it differs in many important characters. In Mercet's table it runs to couplet 33, and is easily distinguished from the genera (*Callipteroma to Dicarnosis*) there set off by the slender antennae and by the peculiar wings and venation.

Genotype.—Vosleria signata, new species.

Female.—Head very large, considerably broader than the thorax, denisciform, thin frontooccipitally, the occiput only moderately concave, with the neck inserted distinctly above the middle but less than halfway to the vertex; as seen from above the outline is narrowly reniform, broadly rounded in front, and about commensurately emarginate in a broad curve at the occipital margin; as seen from the side the occipital margin is straight for most of its course, but curves inward at the top of the head, the curvature in front much less than that of a hemisphere, being a little more abrupt above than toward the mouth; as seen from in front the outline of the head is circular above the lower end of the eyes, but the cheeks are distinctly discontinuous with the outline of the eyes and strongly convergent toward the narrow and subtruncate oral margin, the mouth being relatively small. Eyes proportionately rather small, protuberant below, above almost touching the occipital margin, about twice as long as wide, their long axis coincident with the longitudinal axis of the head, their posterior margin nearly straight, the inner orbits nearly parallel but diverging through the curvature of the head as they approach the occipital margin; postocular area narrow; vertex extremely broad, or over one-half the total width of the head, the occipital margin acute; ocelli minute, arranged in a very large slightly obtuse-angled triangle, the posterior pair remote from the eye margins and nearly as far removed from the occipital margin. Cheeks as long as the width of the eyes, or about one-half the width of the frons, the genal suture obsolete; face convex and without scrobes, the antennae inserted rather close together just below the ocular line, which passes through the dorsal part of the sockets; space between the sockets not protuberant, but conforming to the curvature of the face and somewhat wider below than the length of the sockets.

Antennae slightly longer than the body, slender but not filiform; scape very long and cylindrical, about as long as the width of the head and nearly equaling the pedicel and first three funicle joints combined; pedicel relatively small yet twice as long as thick; flagellum distinctly compressed but not expanded, a little the widest at the middle, and clothed with numerous short bristly setae; funicle six-jointed, the joints decreasing greatly in length distad, but all longer than wide, and increasing in width to the juncture of the third and fourth joints, then decreasing in width; first funicle joint about four times as long as wide, the third twice as long as wide,

each of the last three about one-half longer than wide, but distinctly decreasing in size distad; club elongate oval, rounded at apex, a little longer than the last two funicle joints combined, three-jointed, with the apical joint slightly the longest. Mandibles small relatively to the size of the head and with two short acute teeth at apex; the palpi not examined.

Thorax twice as long as wide, distinctly wider than the depth dorsoventrally, moderately convex above from side to side; posterior margin of pronotum rectangularly emarginate; mesoscutum considerably longer medially than at the sides, and less than twice as wide as long; axillae about one-half wider than long, rather narrowly separated medially, their posterior margin a little elevated above the scutellum; scutellum small, about two-thirds as long as the scutum, strongly depressed, hardly elevated at apex, but increasingly more elevated at the sides toward the base and sharply declivous, only slightly longer than wide, the apical angle somewhat less than 90° and slightly rounded off, the sides a little convexly arcuate. Propodeum large, the median length about equal to two-thirds of the scutellum, yet fully twice as long at the sides as in the middle, gently sloping backward, convex from side to side, medially with a relatively large semioval depression the apex of which is contiguous to the apex of the scutellum, the margins of the depression hardly carinated; the metapleura not separated by a flexure from the disk of the propodeum.

Abdomen rather small, about two-thirds as long as the thorax and narrower; the outline as seen from above rather narrowly oval, the greatest width less than one-half of the length, the apex bluntly rounded; the dorsum deeply sunken in behind the first tergite, the apical tergite very large and covering most of the visible portion of the concavity; venter compressed and vomeriform at apex; ovipositor not protruded and entirely inclosed by the ventrites; cercal or vibrissal plates retracted beneath the first tergite, each with only one long vibrissa visibly projecting from this cavity.

Legs rather long and very slender, including even the femora; the hind femora compressed but not widened; the middle tarsi long and only slightly tapering, the first joint nearly as long as the following joints combined, the tibial spur distinctly shorter; hind tarsi slenderer than the middle pair and nearly as long.

Wings broadly spatulate in shape, the basal half narrow and somewhat constricted just before the point where the disk begins to widen; apical half broadly oval, the apical margin evenly and broadly rounded, the greatest width not much less than one-half the total length of wings; marginal fringe short and dense; disk deeply infuscated and with very dense short setae, relieved by four bare hyaline areas in addition to the costal cell, namely, an elongate

oval or fusiform area on the posterior margin at base of wing; an oval spot at the constricted part of the disk extending obliquely basad from the submarginal vein not quite to the opposite margin; a narrow arcuate crossband with the concave side distad, situated just beyond the middle of the wing at the base of the widest part of the disk and just touching apices of the postmarginal and stigmal veins; and a narrow band at apical margin of the disk. Submarginal vein reaching almost to the middle of the wing, strongly sinuate or curved inward at the constricted region of wing; marginal and postmarginal veins equal, very thick and widest at their juncture, each fully four times as long as wide; stigmal vein forming a right angle with the postmarginal, about three-fourths as long and enlarged at apex, its apical margin very broadly emaginate, the four postules arranged in a curved line. Speculum very oblique, lying almost parallel with the marginal vein and apex of the submarginal and passing into the clear oval area at the constricted part of the disk, beyond this area continued and connecting with the basal clear area. Costal cell narrow except where the submarginal vein curves inward, mostly hyaline and bare excepting a row of setae on the basal third, and a marginal row of setae on the apical third. Setae on the veins very numerous but small, about equaling in size those between the speculum and the marginal vein, which are distinctly but not greatly larger than the remaining discal setae.

Head with very fine roundish reticulations and with numerous minute pin punctures on the frons, which become finer and closer toward the antennal sockets and much sparser toward the vertex, there being practically no punctures on the vertex behind the ocelli; mesoscutum finely reticulate, axillae and scutellum finely longitudinally punctato-reticulate and duller than the scutum; mesopleura microscopically reticulately shagreened, but much more coarsely so on the posterior margin; abdomen very finely reticulate.

Sides of head behind the eyes, the face, cheeks, pronotum, mesoscutum, propodeum, abdomen, and legs provided with numerous appressed fine white setae, which are distinctly longer behind the eyes and on the propodeum; scutellum with very sparce, fine, inconspicuous setae and two rather long bristles at apex; frontovertex almost bare, the very few fine setae present being very inconspicuous; eyes with sparse, very short, erect setae.

Coloration metallic but not brilliant, the surface of body being moderately and not uniformly shiny.

Male.—Not known.

VOSLERIA SIGNATA, new species

Plate 1, figs. 1 and 7

Female.—Head shiny fuscous with an obscure bluish luster, the occiput above the neck yellowish brown, a small dot on each side

of vertex at dorsal end of eyes and the antennal sockets brown, the oral margin narrowly and obscurely also brownish; mandibles brown, the teeth blackish; antennae wholly blackish, the scape with an obscure metallic luster; thorax and abdomen plumbeous or slightly greenish black, the metallish luster most apparent and greenish on the mesoscutum, the mesopleura the most shiny parts, their surface no smoother than the scutum but without pubescence, the axillae and scutellum dullest but not matt; legs concolorous with body, the femora with a bluish or plumbeous luster, the articulations obscurely brownish, the tarsi yellowish brown and darker at apex, the spur of middle tibiae yellowish; wings dark brown with white spots and bands, the veins fuscous.

Length of body, 1.75; length of head, 0.695; width of head, 0.667; width of vertex at anterior ocellus, 0.388; thickness of head fronto-occipitally, 0.306; length of antenna, 1.81; width of mesoscutum, 0.528; length of fore wing, 1.48; width of fore wing, 0.570 mm.

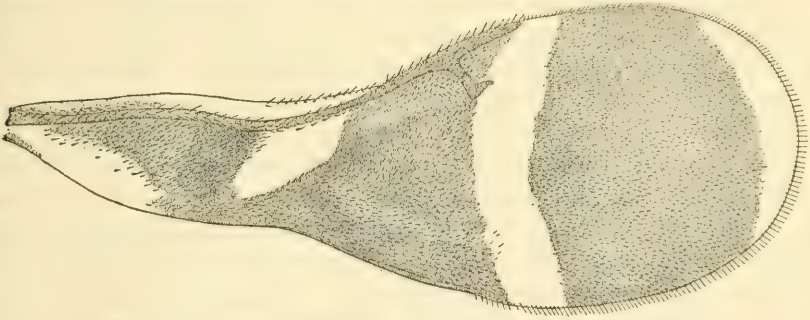

FIG. 1.—VOSLERIA SIGNATA TIMBERLAKE. FORE WING OF FEMALE

Described from one female (holotype) reared in 1918 from a species of *Pseudococcus* (California State Insectary No. 3971) collected at Sunshine, Victoria, Australia, by E. J. Vosler

Type.—Cat. No. 28113, U.S.N.M.

CYRTOCORYPHES, new genus

This genus has the habitus of *Homalotylus* Mayr and agrees in the general form of body, shape of head, and in the conformation of the antennae, legs, and wings, but differs from it especially in the essentially Ectromatine mandibles and abdomen and in other details. It is therefore really more closely related to the *Ectroma* group of genera. In Mercet's tables it runs out at couplet 36, but disregarding the postmarginal vein it would run fairly well to *Ectroma* (*Aglyptus* Förster), from which it differs in having the marginal vein shorter, the postmarginal shortly developed, the mesoscutum without parapsidal lines, the axillae fused with scutellum, the differently shaped head with comparatively narrow vertex, etc.

Genotype.—Cyrtocoryphes viridiceps, new species.

Female.—Head hemispherical, nearly as wide as long and about one-half as thick frontooccipitally as wide; as seen from in front the outline is nearly circular, but the eyes are slightly protuberant, especially below, and discontinuous with the cheeks, the latter converging a little toward the mouth, the oral margin truncate and a little wider than the distance between the lower ends of the eyes; as seen from above the outline is nearly semicircular, but more strongly rounded at the sides; as seen from the side the outline is also semicircular, with the curvature uniform from occipital to oral margin. Occiput nearly flat or only slightly concave above, the neck inserted near the middle; eyes large, broadly reniform, with the posterior margin moderately and broadly emarginate, widest near ventral end, where the width is a little more than one-half the length, dorsally almost touching the occipital margin; space between the eyes moderately wide, the part visible in dorsal view of head nearly twice as long as wide and slightly less than one-third as wide as the whole head; ocelli small and in an acute-angled triangle, the posterior pair almost touching the eye margins and remote from the occipital margin; portion of the head below the eyes very short and in frontal view of head not more than one-third as long as wide; cheeks very short but distinct, and about as long as one-third the width of the eyes; face convex, almost without scrobes, the antennal sockets placed rather close together at the oral margin, the space between them somewhat greater than their own length and about equal to the space between the sockets and the nearest point of the eyes; above each socket is a short scrobal sulcus no longer than the socket itself; face and cheeks separated by a slight angulation, which forms an obscure carinalike ridge continuous above with the inner orbits of the eyes.

Antennae about as long as the body, slender throughout; scape compressed but linear and of uniform width, including the radicle it is somewhat longer than the head; pedicel about thrice as long as wide, distinctly shorter than the first funicle joint and slightly longer than the second; flagellum cylindrical, rather thick, or a little wider than the apex of the pedicel; funicle six-jointed, clothed with short, rather coarse, decumbent setae, the joints decreasing in length distad, the first about four times as long as thick, the sixth not quite twice as long as thick; club three-jointed, elongate oval, rounded at apex, hardly wider than the funicle and about as long as the last two joints and one-half of the fourth joint of the funicle combined.

Mandibles rather small, narrow in frontal view and with two acute teeth at apex, of which the inner one is the larger. Maxillary palpi short, tapering, almost straight, four-jointed; two basal joints

about twice as long as thick, the third somewhat shorter, the fourth longest but not quite as long as the two preceding joints combined, provided with two or three short setae on the inner side near apex and one longer seta at the apex. Labial palpi three-jointed, basal and apical joints each about thrice as long as thick, the middle joint nearly twice as long as thick.

Thorax robust, about one-half longer than wide, not quite so thick dorsoventrally as wide and convex above; pronotum strongly arcuate; mesoscutum nearly twice as wide as long, its posterior margin sinuate and with a small median lobe projecting over the inner tips of the axillae; the latter rather long at the sides, somewhat separated medially by the projecting lobe of the mesoscutum but actually meeting underneath this, the suture separating them from the scutellum very indistinct or obsolescent, so that they are practically fused with the scutellum; excluding the axillae the scutellum is quadrangular with the apex acute, its disk rather strongly depressed, the margins not very strongly elevated yet abruptly declivous. Propodeum extremely short medially or almost separated into two moderately large sidepieces, of which the posterior halves are declivous and largely concealed by the base of the abdomen; metapleura very small and narrow.

Abdomen as long as the head and thorax combined, its base narrower than the thorax, its outline as seen from above in the form of a very acute isosceles triangle; the dorsal surface deeply sunken in, the cercal plates retracted almost to the basal margin; the venter considerably compressed, the apical ventrite vomeriform and inclosing the ovipositor, which is slightly protruded.

Legs long and slender, excepting that the front and hind femora are compressed, the front femora being broader than the hind pair, middle legs distinctly longer than the hind pair, the tarsi tapering, the tibial spur long; hind tarsi about as long but much slenderer than the middle tarsi.

Wings rather small and narrow, but reaching much beyond the apex of abdomen; discal setae very fine and dense, becoming finer and hyaline in the arcuate band just beyond the apex of venation, the basal fourth of the disk bare; speculum narrow and very distinct, yet reaching hardly more than one-half the way across the disk; submarginal vein slender, marginal about twice as long as wide, postmarginal very short but distinct, stigmal vein about as long as the marginal and postmarginal veins united, and reaching about opposite to the middle of the costal margin.

Head with a very fine, dense, thimblelike puncturation and with sparse, well scattered, very minute pin punctures; mesoscutum smooth and shiny yet with a delicate, very fine reticulation and with minute setigerous punctures; axillae and scutellum opaque from a

dense microscopic thimblelike puncturation, which is finer than that of the head; pleura finely reticulately shagreened, abdomen finely reticulate.

Eyes bare, the frontovertex and face with sparse, semierect, very fine short setae, the face below the eyes with equally fine appressed whitish pubescence; mesoscutum with rather numerous fine and short, dark-colored setae; the base of the scutellum with a few considerably coarser setae and its apex with a pair of long bristles; sides of propodeum moderately densely covered with glistening white appressed pubescence, the metapleura and hind coxae bare, abdomen apparently wholly bare.

Coloration rather brilliantly metallic; the antennae blackish, but with the club white.

Male.—Not known.

CYRTOCORYPHES VIRIDICEPS, new species

Plate 1, fig. 5; plate 2, fig. 19, 19*a*

Female.—Head bright metallic emerald green (Ridgway), changing to blue green on the face and cheeks below the eyes; thorax and abdomen metallic dark violet blue, except the axillae and scutellum, which are matt fuscous or with a metallic sheen only when viewed at a very oblique angle from the side; antennae fuscous, the club white; coxae and hind femora concolorous with the thorax, front and middle femora and all the tibiae fuscous, the spur of middle tibia and the tarsi brownish yellow. Wings with a broad discal band deeply infuscated, reaching from the middle of the submarginal vein to apex of the stigmal, its distal margin strongly rounded, the basal margin squarely truncate; following the discal band is a curved, rather narrow, clear band imperceptibly grading distad into the faintly infuscated area on apical fourth of the disk; somewhat less than basal fourth of the wing is hyaline, but with an infuscated streak from the base of the submarginal vein along the posterior margin for a short distance; veins brown, but the part of the submarginal vein opposite the hyaline area is nearly transparent.

Length of body, 1.28; length of head, 0.426; width of head, 0.410; thickness of head frontooccipitally, 0.249; width of vertex at posterior ocelli, 0.132; length of antenna, 1.30; width of mesoscutum, 0.426; length of fore wing, 1.11; width of fore wing, 0.440 mm.

Described from one female (holotype) collected at Ba, Letu Vitu, Fiji, in 1906 (F. Muir).

Type.—Cat. No. 1240, Hawaiian Sugar Planters' Experiment Station.

PSEUDORHOPUS, new genus

Rhopus MAYR, 1875 (excluding male), Verh. zool.-bot. Ges. Wien, vol. 25, p. 690.—GIRAULT, 1915, Journ. New York Ent. Soc., vol. 23, p. 169.—MERCET, 1921, Fauna Iberica, Himen., Fam. Encértidos, p. 83, figs. 8–10.

Pseudorhopus is a new name for *Rhopus* of authors, not Förster, and has for its type *Encyrtus testaceus* Ratzeburg. Mercet has cited *testaceus* as the type of *Rhopus* Förster, but this can not be, as Förster cited *Encyrtus piso* Walker as the type. Mayr synonymized *piso* with *testaceus* with some doubt, as he had not seen the type of *piso*, and I am now able to show with considerable certainty that the males which he placed with *testaceus*, including the specimen of *piso* received from Walker, have nothing to do with *testaceus*. This conclusion is based on the study of a fine series of a closely related North American species, including both sexes, the males being very similar to the females except in the primary sexual characters, and like them in having a five-jointed funicle. The male of this species (described below as *hartmani*) is so exceedingly like the female that I believe it is very likely that Mayr overlooked the true male of *testaceus* in the large series of specimens reared from *Physokermes piceae* Schrank, which he thought were all females.

As the genus *Pseudorhopus* has the characters assigned to *Rhopus* by Mayr, and has been further elucidated by Girault and Mercet, it does not need to be redescribed here. The broad edentate mandibles, the shore antennae with the five-jointed funicle and entire club, the short submarginal vein, punctiform marginal vein, short stigmal and postmarginal veins, and the short tarsal joints are all peculiar characteristics by reason of which the genus can hardly be mistaken. Although the mandibles are similar to those of *Encyrtus*, I do not believe that *Pseudorhopus* is closely allied thereto. Mercet has suggested its affinity to *Arrhenophagus* Aurivillius, and it is perhaps the nearest approach to that isolated genus of all the Encyrtinae.

Rhopus itself was described by Förster in rather negative terms, the only positive characters given being the gradual transition of the frontovertex into the face (not separated by a sharp angulation), the strongly depressed body and nonmetallic coloration. Nothing is said about the antennae having a five-jointed funicle, and the genus is placed with others having the normal number of joints. The type species *piso* was described by Walker as having the body depressed; the head small, transverse, and very short, the antennae slender, filiform, pilose, almost as long as the body, the funicle six-jointed, the joints long and linear, the club fusiform and nearly twice as long as the preceding joint; the wings long, narrow, and with a short marginal fringe. Judging from these characters it seems to me that *Rhopus* is very close to *Xanthoencyrtus* Ashmead and probably the same.

PSEUDORHOPUS HARTMANI, new species

Plate 1, figs. 2 and 11; plate 2, fig. 14

Female.—Head slightly wider than long, thin frontooccipitally, as seen from in front broadly rounded above, the sides well rounded and a little convergent toward the broad truncate oral margin; occiput perfectly plane on lower half, moderately concave above the middle, with the neck inserted at the middle of this concavity, considerably above the center of the occiput as a whole; eyes small, nearly circular, only slightly longer than wide, the ventroposterior margin slightly flattened; frontovertex much broader than long, the ocelli in a very obtuse angle, the posterior pair about one-half as far from the eye margins as their distance apart and much closer to the occipital border; cheeks rather long and equal to the length of the eyes. Face with a very distinct large depression with sloping sides, reaching from a little above the oral margin at the insertion of the antennae far upward between the eyes, the inferior part divided by the triangular prominence between the antennae; this prominence being broadly convex, not very high, a little longer than its greatest width and reaching upward a little beyond a line drawn tangent to the lower margin of the eyes; superiorly the depression is separated from the frontovertex by an angulation.

Antennae inserted far apart slightly above the oral margin; scape flattened, linear, and slightly wider on the basal half; pedicel twice as long as thick, as long as the following three and one-half joints combined; flagellum rather strongly clavate, the first three funicle joints subequal, slightly wider than long, and increasing slightly in width distad, the fourth and fifth joints increasingly both wider and longer, the fifth being considerably wider than long; club a little longer than the entire funicle, distinctly increasing in width toward the apex, where it is obliquely truncate, the greatest width nearly twice that of the preceding joint.

Mandibles with a very broad truncate margin at apex; maxillary palpi two-jointed, the basal joint a little longer than thick, the apical joint about three times as long, tapering and with two setae at apex; labial palpi with only one fusiform joint, which is about one-third as long as the entire maxillary palpus.

Thorax short, robust, about as thick dorsoventrally as broad and rather convex above; pronotum strongly arcuate and hardly visible in dorsal view; mesoscutum large, about one-third broader than long, its posterior margin straight; axillae much wider than long, acute, and meeting medially; scutellum distinctly four-sided, longer than wide and reaching almost to the base of the abdomen, the apex rather acutely angled, the sides abruptly declivous, the disk depressed; propodeum very short medially, but lengthening at the

sides. Abdomen somewhat shorter than the thorax, triquetrous in shape, the dorsal surface rather depressed; ovipositor entirely concealed and inclosed by the ventrites, and when dissected out it proves to be very short and minute.

Legs rather short but slender; tarsi of the middle legs about two-thirds as long as the tibiae, cylindrical, and not at all thickened at base, not much shorter than the hind tarsi, the first joint as long as the next two combined, the second to fourth joints equal and no longer than thick, the fifth slightly longer than those just preceding; spur of middle tibiae as long as the basal joint of the middle tarsi. Wings moderately wide, the marginal fringe short; submarginal vein not quite reaching to the middle of the wing, the stigmal given off just before the vein reaches the costal margin; the postmarginal vein very short, both it and the marginal taken together being practically punctiform, stigmal vein short, only slightly thickened at apex and not very distinct; speculum moderately narrow and interrupted below the middle.

Head, thorax, and abdomen smoothish, with a fine reticulate sculpture; head very finely and rather indistinctly reticulate except on the frontovertex, where the reticulations are coarser and the surface is somewhat roughened; mesoscutum with a scaly reticulation, the reticulations of the scutellum somewhat longitudinally lengthened. Pubescence throughout short, fine, and inconspicuous, but rather abundant on the face, on the frontovertex, and along the inner orbits of the eyes, and sparser on the thorax; eyes nearly bare.

General color of the body nearly ochraceous orange (Ridgway), the cheeks posteriorly, occiput, under parts of thorax, and the legs paler yellow; antennae about concolorous with the face; apical joint of the tarsi more or less fuscous; wings hyaline, with a minute smoky spot beneath the middle of the stigmal vein, the apical part of the submarginal vein also bordered with a slight infuscation.

Length of body, (0.733 to) 0.800; length of head, 0.329; width of head, 0.388; width of frontovertex, 0.216; length of antenna, 0.629; width of mesoscutum, 0.334; length of fore wing, 0.893; width of fore wing, 0.374 mm.

Male.—Very similar to the female, but the antennae are somewhat less clavate, the scape wider, the pedicel distinctly constricted at apex, the club smaller and oval; coloration noticeably darker, the scutellum brown and becoming fuscous at the apex, the abdomen also more or less brownish, but the under parts of thorax, the legs, and antennae colored about as in the female.

Length of body, (0.766 to) 0.926[1]; length of head, 0.306; width of head, 0.341; width of frontovertex, 0.207; length of antenna,

[1] This specimen is probably not actually larger than any of the females, but the abdomen became swollen in the preserving fluid and did not collapse after mounting.

0.558; width of mesoscutum, 0.334; length of fore wing, 0.841; width of fore wing, 0.384 mm.

Described from 32 females and 11 males (holotype female, allotype, and paratypes) reared from a species of *Lecanium* (No. 57), Austin, Texas, May 15, 1913 (Carl Hartman), No. 61. The specimens were preserved in spirits before being mounted and many of them are considerably bleached. The head of one of the male paratypes has been lost.

This species is distinguished from *P. testaceus* (Ratzeburg) by the more clavate antenna with the club obliquely truncate and by the longer basal joint of the middle tarsi; *testaceus* is also said to have the body considerably depressed, but this is not true of *hartmani.* The coloration of the two species is apparently about the same. *Rhopoideus fuscus* Girault, which was later transferred by its author to *Rhopus*, should be cited as *Pseudorhopus fuscus* and is distinguished from both *hartmani* and *testaceus* by the much darker coloration and larger size.

Type.—Cat. No. 28141, U.S.N.M.

HEXACNEMUS, new genus

In Mercet's table of genera *Hexacnemus* female runs to couplet 62, where it runs out, as it agrees with neither alternative, the abdomen being depressed and the antennae strongly filiform. In Girault's table the female runs to the couplet containing *Isodromoides* and *Neocopidosomyia*, but the face is not inflexed and the marginal vein is punctiform. In Ashmead's table it runs to *Pentelicus*, but it disagrees in many particulars with that genus. In Howard's table of the Tetracnemini the male runs to *Hexacladia* on account of the six-branched antennae, but is certainly not even closely allied to that very characteristic genus. Howard's group Tetracnemini, with the exclusion of *Hexacladia* and *Tanaostigma*, is perhaps a natural group of which *Hexacnemus* forms a very distinct member.

Genotype.—Hexacnemus armitagei, new species.

Female.—Head menisciform, thin frontooccipitally, about as wide as the thorax and a little wider than long; in frontal view it is fully rounded below and on the sides but depressed above, with a slight emargination on each side of the vertex at the margin of the eyes; in dorsal view appearing gently rounded in front, strongly rounded at the sides and strongly incurved at the occipital margin; in side view not quite uniformly convex from oral to occipital margin, being slightly depressed below and thickest frontooccipitally a little above the middle; occiput deeply concave, the dorsal margin acute. Frontovertex moderately broad and widening below, the whole area between the eyes over twice as long as its least width; ocelli arranged in a slightly obtuse-angled triangle, the posterior pair about one-

half of their own diameter or slightly less from the margin of both the eyes and the occiput; eyes moderately large, oval, vertical, contiguous dorsally with the occipital margin, about as wide as one-third of the whole head; cheeks almost as long as one-half the width of the eyes, the genal suture distinct; face short and broad, the scrobes short, linear, acutely converging yet meeting above in a curve, the interspace very slightly convex and about twice as long as wide.

Antennae inserted rather close together and very close to the clypeal margin, the sockets being separated from each other by a space about equal to their own length, and divided from the clypeal margin by a space somewhat less than their own width. Scape long and cylindrical, including the radicle somewhat longer than the eye; pedicel about twice as long as thick and nearly equal to the following joint in both length and width; flagellum moderately long and cylindrical, the funicle joints increasing just perceptibly in thickness distad; funicle six-jointed, the first joint about twice as long as thick, the following joints gradually shortening, the last one only slightly longer than thick; club solid, cylindrical, about equal to the last three funicle joints combined, its outer surface collapsing in the form of a furrow.

Mandibles moderately wide, expanding slightly at apex, the teeth rather long and stout, spreading a trifle, a little rounded at their tips, the middle one slightly larger than the other two. Maxillary palpi moderately long, four-jointed, the first two joints about as long as thick, the third as wide as long, the fourth somewhat thicker and fusiform, about as long as the first two joints combined; labial palpi, rather short, stouter than the basal joints of the maxillary pair, three-jointed, the middle joint very short and rather wider than long, the apical and basal joints subequal, rather longer than the basal joint of the maxillary pair, the apical joint oval.

Thorax robust, strongly convex above, with the thickness dorso-ventrally not quite equal to the width; pronotum strongly arcuate; mesoscutum large, its median length a little more than one-half the width, its posterior margin convexly arcuate, especially medially; axillae short, over twice as wide as long, the inner tips narrowly truncate and meeting, but normally concealed by the posterior margin of the mesoscutum so that the axillae appear to be slightly separated; scutellum large, slightly longer than wide, the sides moderately bulging, well elevated and abruptly declivous, the apex rather acutely rounded, the disk strongly depressed; propodeum short medially but lengthening toward the sides, and strongly arched from side to side.

Abdomen about as long as the thorax, ovate; the dorsum depressed, the cercal plates situated a little basad of the middle; the

venter with a strong median plica, the ventrites entirely inclosing the ovipositor to the apex of abdomen; the ovipositor, however, strongly protruded, the sheaths slender, cylindrical, and nearly one-half as long as the abdomen.

Wings rather wide and reaching to the apex of the ovipositor; the disk moderately densely covered with very short, pale setae, the basal area beneath the submarginal vein bare; the speculum narrow, separated from basal area by a row of about seven coarser setae, but uniting therewith at a point a little more than one-half way to the posterior margin; marginal fringe extremely short or obsolescent; venation short or extending but little more than one-third of the length of the wing, the costal cell rather wide; submarginal vein not thickened distally, the marginal punctiform, the stigmal emitted before the vein quite reaches the margin, the postmarginal extremely short, both it and the marginal taken together being strongly thickened and no longer than wide, the stigmal rather short, somewhat curved, and not much enlarged at apex. Hind wings broad, the costal cell wide and extending to the hooklets, the marginal fringe better developed than in the fore wings.

Legs of moderate length and normal structure; the middle tarsi strongly tapering, the first joint nearly as long as the following joints combined; spur of the middle tibiae stout and almost as long as the first joint of the middle tarsi; hind tarsi rather slender, nearly as long as the hind tibiae, the basal joint about as long as the next three joints combined, the last four joints nearly equal, with the fourth joint somewhat the shortest.

Head, except in the scrobal region of face, with very large refulgent thimblelike punctures, which are rather crowded or almost confluent in the space lying between the eyes and the scrobes but sparser on the frontovertex, the surface otherwise being very finely reticulate or equally finely rugulose on the vertex; mesoscutum very finely reticulate and with seriate shallow pin punctures; scutellum duller than the scutum because of the dense microscopic thimblelike puncturation.

Eyes bare; the large punctures of head each bearing a short subappressed glistening white seta; mesoscutum with similar more flattened setae, interspersed or replaced with blackish setae along the anterior margin; scutellum with a few fine scattered dark-colored setae, and a pair of long fine bristles at the apex. Coloration metallic, but not brilliant.

Male.—Similar to the female, except in the characters of the head, antennae, and abdomen. Head somewhat thinner frontooccipitally and considerably more flattened anteriorly; in side view appearing convex only dorsally, and considerably depressed anteriorly in dorsal view; eyes less than one-half as large as in the female and

about one-third longer than wide; frontovertex broader, being fully one-half wider than long; ocelli very large, in a more obtuse-angled triangle, the posterior pair touching the acute occipital margin and removed by one-half of their own diameter from the eye margins; cheeks fully as long as the eyes; face with a median rounded ridge extending from the clypeal margin to a little above the antennal sockets, or about two-thirds of the length of the face, and somewhat widening above the antennae; scrobes uniting above in a large common impression, somewhat triangular in shape, with the apex truncated and with sloping walls; antennal sockets situated in slight depressions on each side of the facial prominence about halfway between the ocular line and the clypeal margin, yet noticeably closer to the clypeal margin than to the nearest point of the eye.

Scape moderately long, reaching somewhat beyond the scrobal impression, slender and compressed, considerably shorter and a little stouter than in the female; pedicel hardly longer than thick; funicle six-jointed, each joint with a long, slender, cylindrical branch of which the second is longest, the following gradually shortening, the sixth about two-thirds as long as the second; basal part of first joint no longer than thick, that of second joint slightly longer, the following joints gradually lengthening, the base of the sixth being about thrice as long as thick; club solid, compressed, clavate, and widest near the apex, about as long as the basal parts of the last three funicle joints combined; all parts of the funicle and club provided with fine, soft, short setae.

Abdomen triangular in shape, strongly depressed, about one-half as long as the thorax, the venter with a median plica.

HEXACNEMUS ARMITAGEI, new species

Plate 1, fig. 10; plate 2, figs. 16, 20, 23, and 23*a*

Female.—General color metallic black, the head, pleura, and abdomen more lustrous; occiput with a strong green luster, cheeks bluish, the face, especially the antennal prominence and the scrobes, with a bluish and purple luster, the large punctures with a pale greenish luster; mesoscutum slightly greenish, the axillae and scutellum opaque, although the margins of the latter are metallic green; pleura dark metallic blue; abdomen bluish green, the apical tergite with two narrow, parallel, longitudinal, slightly impressed yellowish lines at the middle, the ovipositor black but becoming slightly brownish beneath at base; legs bluish black, the front tibiae, basal half of middle tibiae, and all the tarsi brownish yellow, the front and hind tarsi dusky above, with the last one or two joints fuscous, the middle tarsi with only the last joint fuscous; antennae black, mandibles brown; wings clear, whitish hyaline, becoming nearly invisible when mounted in balsam, the veins brownish.

Length of body, (1.66 to) 1.93; length of head, 0.608; width of head, 0.723; width of vertex at ocelli, 0.261; length of antenna, 1.50; width of mesoscutum, 0.645; length of fore wing, 1.53; width of fore wing, 0.702; length of ovipositor, 0.325 mm.

Male.—Similar to the female in coloration, the pleura, sternum, and venter more strongly bluish and purple, the apex of the abdomen above also brilliant blue and purple; the white setae of mesoscutum sometimes more or less numerous, or replaced with blackish setae.

Length of body, (1.60 to) 1.83; length of head, 0.601; width of head, 0.784; width of vertex at ocelli, 0.386; length of antenna, 1.42; width of mesoscutum, 0.716; length of fore wing, 1.72; width of fore wing, 0.813 mm.

Described from eight females and nine males (holotype female, allotype, and paratypes) reared from Hemerobiid cocoons collected November 5 and 30, 1919, at Ojai Valley, California (H. M. Armitage). Two species of *Sympherobius* were reared from the same lot of cocoons, one of these being *S. californicus* Banks.

Type.—Cat. No. 28142, U.S.N.M.

AZTECENCYRTUS, new genus

This genus has much the habitus of *Homalotylus* Mayr, and agrees with it in many important characters, but differs in the shape and dentition of the mandibles, the length of the antennae, and particularly that of certain joints, such as the scape, pedical, and first funicle joint, and in having the head thicker and more hemispherical, the wings narrower, with the stigmal and postmarginal veins more unequal and much less nearly parallel, the surface of the body much smoother and shiny, but not polished, and the coloration wholly nonmetallic. *Aztecencyrtus* also closely resembles *Brethesiella* Porter in many respects.

Genotype.—*Aztecencyrtus flavus*, new species.

Female.—Head hemispherical, rather thick frontooccipitally, the curvature uniform from occipital to oral margin; in dorsal view appearing semicircular but more strongly rounded on the sides than in front, the occipital margin very slightly arcuately emarginate; as seen from the side the outline is somewhat semicircular, with the curvature considerably less at the face than dorsally; as seen from in front the length and width are about equal, the outline fully rounded above, the sides considerably less rounded, the cheeks converging a little toward the broad truncate oral margin. Occiput only very slightly concave, the neck inserted near the middle, the dorsal margin distinctly angled; eyes moderately large, about one-half longer than wide, oval, and widest near the anterior end, the inner orbits parallel as seen in dorsal view of head; frontovertex twice as long as wide, the width distinctly less than one-

third the total width of head; ocelli in an equilateral triangle, the posterior pair remote from the occipital margin and almost touching the eye margins; cheeks short, but not much shorter than the width of the eyes; face convex, the scrobes very small, suboval, not much longer than their distance apart, each containing the small round antennal socket and separated from each other by the broad low prominence between the antennae, which is about twice as long as wide, parallel-sided, not at all protuberant, and merging above into the contour of the face.

Antennae inserted moderately far apart, rather close to the oral margin; scape short in comparison with *Homalotylus*, cylindrical, a little thicker at the middle, including the radicle nearly as long as the pedicel and funicle combined, but much too short to reach to the anterior ocellus, pedicel very short or hardly longer than thick; funicle six-jointed, cylindrical, and increasing very slightly in thickness distad; the first joint ringlike, more than twice as thick as long, hardly more than one-fourth as long as the next joint; the other five joints subequal in size, the second and third as long as wide, the sixth somewhat wider than long; club, except the extreme base, missing in the unique type, but the remnant indicates that it is at least somewhat wider than the funicle.

Mandibles unusually short and broad, with three coarse, spreading, acute teeth, the middle tooth the largest, the outer one much the smallest, the apex lying in the same plane as the base and moderately curved inward. Maxillary palpi short, four-jointed, the basal joint very short, transverse, the second about thrice as long as thick, the third one-third shorter than the second, the fourth much thinner than the preceding joint and about as long as the second; labial palpi two-jointed, the joints about equal in length, the first thrice as long as thick, the second oval and thicker.

Thorax fully twice as long as wide, depressed, the thickness dorsoventrally less than the width, the parts of the mesonotum lying in one plane; pronotum moderately arcuate; mesoscutum twice as wide as long; axillae large, broadly contiguous at inner tips; scutellum rather small, the sides slightly bulging, abruptly declivous and moderately elevated, the apex rather acutely rounded, the disk depressed, the length and basal width about equal; propodeum moderately large, much shortened medially, transversely convex, and considerably sloping toward the apex.

Abdomen about two-thirds as long as the thorax, somewhat less than twice as long as wide, depressed above, the outline in the form of an oval strongly truncated at basal end; cercal plates situated a little beyond the middle; venter slightly compressed, the sides gently sloping to the median line, the last ventrite reaching to the apex and inclosing the internal part of the ovipositor, which reaches ap-

parently to the base of the abdomen; extruded part of ovipositor very long and slender and somewhat longer than the abdomen.

Legs long and slender, much as in *Homalotylus*, but the front and hind femora are much less compressed and much narrower, the hind tarsi are very slender and filiform, whereas the middle tarsi and tibial spur are like *Homalotylus.* Wings long and narrow, and very similar to *Homalotylus;* submarginal vein nearly straight, not enlarged distad, the setae on it very fine; marginal as in *Homalotylus;* stigmal and postmarginal veins moderately long and shorter than in *Homalotylus*, the stigmal enlarged at the apex, forming an acute angle with the postmarginal and not parallel with the margin; marginal fringe very fine, short and dense; disk of wing with a transverse infuscated band which is narrower and fainter than in *Homalotylus*, the apical half of disk clear and uniformly setose, the base of disk nearly bare out to the infuscated band; speculum narrow above and reaching to the base of the stigmal vein, broadening below at middle of disk where it passes out of the infuscated band and joins the nearly bare area at base of wing; costal cell bare except for one row of fine setae next to the margin of the wing in the apical third.

Sculpture extremely fine and microscopic throughout; the frontovertex dull from very shallow, close, thimblelike punctures; the mesonotum somewhat shiny and smooth and with a delicate microscopic reticulation; the propodeum smooth and considerably polished; the pleura with a more or less longitudinal reticulation coarser than that of the mesoscutum, but the propleura and the mesopleura anteriorly are equally finely striolate-reticulate; abdomen slightly more coarsely reticulate than the mesoscutum.

Pubescence very fine and short, white or whitish, and apparently not very dense except on the metapleura and hind coxae, where it is of the same type as in *Homalotylus;* the eyes almost bare. Coloration mostly yellow, nonmetallic, the antennae yellowish with the club apparently not paler.

Male.—Not known.

AZTECENCYRTUS FLAVUS, new species

Plate 1, fig. 8; plate 2, figs. 22, 22*a*

Female.—Face with sparse glistening white pubescense, the setae arranged in a row on the lateral margins of the prominence between the antennal scrobes and evenly distributed on the face and cheeks exterior to the scrobes; pubescence of mesonotum almost all denuded in the type, but apparently sparse, fine, and whitish; abdomen nearly bare, but there are a few fine whitish setae on each side except at base and apex; ovipositor sheaths with sparse appressed setae; pubescence of legs and antennae also very fine and short. Nearly

bare area at the base of wing, with a few fine, nearly transparent setae arranged in about four oblique rows more or less distinctly continuous with the rows of setae between the speculum and the apex of the submarginal vein.

Frontovertex, most of face and cheeks, upper part of occiput, pronotum and mesonotum, anterior end of the mesopleura, about the apical third of abdomen and sides of venter nearly capucine yellow (Ridgway); oral margin of face and cheeks, lower part of occiput, propleura, posterior margin of pronotum very narrowly, a little more than the basal third of abdomen, the antennae and protruded part of the ovipositor sheaths paler or about light orange yellow (Ridgway); the legs in part and medial line of venter considerably paler or about pale orange yellow (Ridgway), although the coxae, femora, and tarsi are more whitish and the hind tibiae pale brown, darker at base and light at apex; apex of scutellum, the metanotum, and the propodeum about antique brown (Ridgway), the metapleura and posterior half of mesopleura about raw sienna (Ridgway); a narrow transverse band at middle of abdomen nearly black, covering about one-fifth of the whole length and passing slightly over onto the sides of the venter. Wings hyaline, the infuscated crossband beneath the marginal and stigmal veins interrupted just below the middle of the disk by a longitudinal pale streak parallel with the posterior margin, the band below the interruption somewhat paler; a small brown spot also present on both sides of the base of the submarginal vein; most of the submarginal vein very pale, the rest of the venation brownish.

Length of body, exclusive of ovipositor, 1.78; length of head, 0.521; width of head, 0.542; thickness of head frontooccipitally, 0.332; width of frontovertex, 0.160; length of scape, 0.285; length of pedicel and funicle combined, 0.329; width of mesoscutum, 0.568; length of fore wing, 1.445; width of fore wing, 0.497; length of protruded part of ovipositor, 0.867 mm.

Described from one female (holotype) reared from *Icerya palmeri* Riley and Howard, collected June 28, 1897, at Frontera, Tabasco, Mexico, on the bark of a dyewood tree called "moral" (Dr. C. H. T. Townsend), U. S. Insectary No. 4274°.

Type.—Cat. No. 28143, U.S.N.M.

TACHARDIOBIUS, new genus

In Mercet's table *Tachardiobius* runs to *Metaprionomitus* Mercet; it is distinguished therefrom by the flattened face, strongly sulcate scrobes, emarginate anterior margin of the frons, the obsolescent postmarginal vein, the longer stigmal and the nonmetallic color; the male differs in having much shorter nonverticillate hairs on the antennae and in having all of the funicle joints cylindrical.

Genotype.—*Tachardiobius nigricans*, new species.

Female.—Head rather thick frontooccipitally, about as long as wide, the face abruptly inflexed but the frons not prominent; dorsal surface of the head well rounded at the sides, depressed medially; in frontal view the outline is subcircular, well rounded on the sides, depressed above; in side view the outline is triangular, with the dorsal side not more than one-half as long as either of the other sides, the facial side straight, the other two sides slightly bulging. Occiput moderately concave, its dorsal margin rather acute; eyes rather small, strongly convex, a little longer than wide, the longer axis oblique to the longitudinal axis of the head; frontovertex comprising more than one-third of the total width of head, a little longer than wide, its anterior margin forming an angle of about 90° with the face and deeply notched medially; ocelli large, arranged in a nearly equilateral triangle, the posterior pair somewhat less than their own diameter from the eye margins and about as far from the occipital margin; cheeks broad, convex, and a little shorter than the transverse diameter of the eyes, the genal suture obsolete; face very flat, extending well upward between the eyes, the scrobes in the form of narrow, deep sulci which meet in an angle above and notch the anterior margin of the frons; the oral margin broadly and rather deeply emarginate, exposing the labrum, which bears a rather dense fringe of longish setae.

Antennae inserted rather far apart, about halfway between the oral margin and the ocular line; scape rather long, linear, and a little compressed, reaching slightly beyond the plane of the frons, and including the radicle slightly longer than the pedicel and first four funicle joints combined; pedicel slightly less than twice as long as thick, a little shorter than the first two funicle joints combined; flagellum moderately clavate, the funicle six-jointed, the first joint about one-third longer than thick, the sixth joint as wide as long; club three-jointed, oval, wider than the funicle and a little shorter than three preceding joints combined.

Mandibles with a small acute ventral tooth and a moderately broad inner truncation, the apex, however, not in the same plane with the expansion of the base, as is usual in cases with this type of dentition. Maxillary palpi short and slender, four-jointed, the two middle joints distinctly thicker, the second as long as wide, the first and third about one-half longer than the second, the fourth fully twice as long; labial palpi very short, three-jointed, the basal joint about one-half longer than thick, the last two joints very short and subequal.

Thorax robust, strongly convex above, about one-third longer than wide; pronotum strongly arcuate; mesoscutum about twice as wide as long; axillae short, transverse, and acutely meeting medially;

scutellum a little longer than wide, rather acutely pointed at apex, the disk somewhat depressed medially, but the sides strongly elevated, at first rounded, then abruptly declivous; propodeum very short, even at the sides, and sloping strongly backward, mesopleura considerably narrowed anteriorly and distinctly emarginated on the dorsal margin opposite the root of the fore wing.

Abdomen about as long as the thorax, broadly oval and depressed, or sometimes shrinking so that the dorsal surface becomes more or less sunken in; cercal plates situated beyond the middle of the lateral margins; ovipositor sheaths barely projecting beyond the apex, the spicula free and inserted near base of abdomen.

Legs normal in length and structure; middle tarsi stouter than the hind pair, tapering, the basal joint not quite so long as the next four joints combined; spur of middle tibiae somewhat shorter than the first joint of the middle tarsi. Wings reaching far beyond apex of the abdomen, moderately broad and well rounded at apex; disk including basal area with very short and dense setae, the marginal fringe short and dense; speculum very narrow but distinct, extending obliquely across the disk; apex of venation reaching nearly to the middle of the costal margin, the submarginal vein almost straight and not enlarged distad, marginal vein punctiform, the postmarginal nearly but not quite entirely obsolete, stigmal vein moderately long, at an angle of about 45° with the costal margin, slender at base and triangularly enlarged toward apex.

Face, cheeks, collar of pronotum, and the mesonotum uniformly and very finely subrugulosely reticulato-punctate and rather dull; frontovertex with somewhat coarser, more thimblelike, reticulate punctures; propleura very finely and closely longitudinally lineolate; mesopleura smoothish, but with dense microscopic reticulato-lineolations; metanotum and propodeum smooth; abdomen finely reticulate, not at all rugulose but considerably smoother and more lustrous than the thorax.

Pubescence of head and thorax very fine, short, appressed, and whitish but hardly conspicuous, mostly confined on head to the cheeks and lower part of the face, sparse on the mesoscutum and scutellum, the latter without larger, more erect setae at apex; eyes bare; abdomen with rather sparse, short, fine pubescence on the sides and somewhat longer setae at the apex and on the ovipositor sheaths.

Coloration nonmetallic, rather dull black or brownish black, with cream-colored or pale buff markings on the head and part of the thorax.

Male.—Very similar to the female, but the head is a little shorter and wider, the eyes smaller, the cheeks proportionately longer, the frontovertex wider or no longer than broad, the ocelli arranged in

a right-angled triangle. Scape shorter, just reaching to the plane of the frons; pedicel not much longer than thick, shorter than the first funicle joint; flagellum cylindrical, moderately long, clothed with numerous, uniformly scattered, semierect short setae; first funicle joint slenderer than pedicel and about twice as long as thick, the following joints decreasing a little in length, the sixth about one-half longer than thick; club solid, slenderly oval, somewhat pointed at apex, a little longer than the last two funicle joints combined. Abdomen similar in shape, the cercal plates situated somewhat beyond the middle.

TACHARDIOBIUS NIGRICANS, new species

Plate 1, figs. 3 and 4; plate 2, figs. 24 and 24*a*

Female.—Head slightly brownish black, with pale cream-colored marks as follows: A small spot anteriorly on the ventroposterior orbits of eyes, two pairs of small spots on dorsal orbits at the anterior and posterior corners of the frontovertex, three spots in a transverse line on the face at the middle of the scrobes, the outer spots between scrobes and eyes, the middle one on the triangular prominence between the scrobes; but sometimes the whole ventroposterior orbits are narrowly pale and three sometimes partly confluent marks may occur on the oral margin, the middle one of these in the form of an elongate triangle placed vertically between the antennal sockets, the outer spots situated beneath the sockets. Thorax black, the pleura sometimes more or less brownish; collar of the pronotum sometimes with a small creamy white dot on the posterior corners, the prepectal plates transparent whitish and anterior margin of the mesopleura sometimes creamy white or pale buff; posterior margin of collar except at the sides also sometimes narrowly whitish; tegulae creamy white at the base. Abdomen black, the protruding tip of ovipositor sheaths brownish yellow. Scape and pedicel fuscous, the apical margin of the pedicel whitish; flagellum brownish to rather dark fuscous. Legs varying from brownish to fuscous on the darker parts; in the darker specimens the coxae, trochanters, and femora are nearly black, with the middle trochanters, apex of middle femora, and knee joint of front and hind legs creamy white or yellowish; front tibiae fuscous with an obscure paler spot on outer surface before the apex, the front tarsi brownish at base and with the two apical joints fuscous; middle and hind tibiae yellowish, with two fuscous rings just before and beyond the middle and with a much narrower, more or less incomplete brownish ring at apex; spur of middle tibiae and first joint of middle tarsi pale creamy yellow or whitish, the tarsi gradually growing darker distad, the apical joint fuscous; hind tarsi brownish, the

basal joint somewhat yellowish white, the last two joints more or less fuscous. In paler specimens the front femora have incomplete whitish annuli near the base and the apical ring is much wider; the apex of front coxae and the front trochanters yellowish white; middle femora almost wholly whitish on the outer margin, the dark ring at apex of hind tibiae very obscure or obsolete, the middle and hind tarsi not much infuscated except on the apical joint. Wings hyaline, the veins brownish.

Length of body, (1.04 to) 1.73; length of head, 0.428; width of head, 0.537; width of frontovertex, 0.221; length of antenna, 0.806; width of mesoscutum, 0.526; length of fore wing, 1.437; width of fore wing, 0.657 mm.

Male.—Very similar to the female, except that the pale markings on the head are larger and more or less confluent, the orbital mark on cheeks sometimes uniting with the dot between the scrobes and the eyes and then with the dot on the anterior corners of the frons, also broadening to join the spots below the antennal sockets, so that the whole lower part of the face is pale except for an inverted V-shaped mark between the antennal sockets and oral margin; flagellum brown.

Length of body, (1.17 to) 1.29; length of head, 0.344; width of head, 0.438; width of frontovertex, 0.200; length of antenna, 0.763; width of mesoscutum, 0.412; length of fore wing, 0.992; width of fore wing, 0.462 mm.

Described from 16 females and 10 males (holotype female, allotype, and paratypes) reared February 3 to April 5, 1919, from *Tachardiella larreae* (Comstock) on greasewood, collected at Arlington, Arizona, January 23, 1919 (Charles H. Gable). The parasites were reared out at Washington, D. C., by C. S. Menagh.

Type.—Cat. No. 28144, U.S.N.M.

Two females reared from the same host collected at Pigeon Pass, near Riverside, California, January, 1908, (California State Insectary), are apparently the same species but are not included among the types. They differ in having the pale markings on the head very faint and partly obsolete.

GAHANIELLA, new genus

Similar in some respects to *Agromyzaphagus* Gahan and comes next to that genus in my manuscript table of genera. In Mercet's table of genera the female runs to *Ooencyrtus* and the male to the first alternative in couplet 87, where it runs out, as the occipital margin is acute and the thorax is not at all brilliant metallic. This genus is named for A. B. Gahan, of the United States National Museum, in recognition of his careful work on parasitic Hymenoptera.

Genotype.—*Gahaniella californica*, new species.

Female.—Head moderately thin frontooccipitally, somewhat wider than long, the face inflexed; as seen in dorsal view well rounded on the sides, transverse in front between the eyes, and slightly emarginate in a broad curve at occipital margin; in side view about one-half as thick as long, the planes of the face and frontovertex meeting in an obtuse angle; as seen from in front widest a little above the lower ends of the eyes, well rounded on the sides above this point, gently rounded medially above and with the cheeks converging toward the mouth, so that if the lines were continued they would meet in an acute angle, but they are truncated by the oral margin, which is transversely arched. Occiput weakly concave, the dorsal margin acute; eyes rather small, nearly circular in outline and bordering the occiput posteriorly; frontovertex slightly broader than long, more nearly one-half than one-third as wide as the whole head; ocelli large, arranged in a large right-angled triangle, the posterior pair about their own diameter from the eye margin and much closer to the occipital margin; cheeks as long as the eyes, without a genal suture, and arcuately converging. Face wider than long, rather depressed; the antennae inserted close together far above the oral margin and about on the ocular line, the space between the sockets one-half or less than one-half the distance between the sockets and oral margin; the upper half of face between the eyes with two deep linear sulcate scrobes, which are close together, nearly parallel and reaching to the angulation separating the face from the frons; prominence between the antennae very narrow and carinalike above where it separates the scrobes, but below the antennae it broadens out triangularly and extends nearly to the oral margin; sometimes through shrinkage of the head the face has a large, rather deep, quadrangular depression, with the two basal sides longer than the ventral sides.

Antennae with the scape short, projecting but slightly beyond plane of the frons, and including the radicle shorter than the following four joints combined, in shape subclavately cylindrical; pedicel hardly longer than thick; funicle six-jointed, the joints subequal in length, scarcely increasing in width distad, the first as long as wide and about as wide as the pedicel, the sixth slightly wider than long; club small, oval, three-jointed, a little shorter than the three preceding joints combined; all the joints of the flagellum with linear, longitudinal sensoria.

Mandibles broadly truncate at apex, with a slight emargination at the outer corner, the apex lying in the same plane as the base. Maxillary palpi four-jointed, rather short, the first three joints decreasing in length, the second thickest, the third smallest and thinnest, the fourth slightly fusiform, slender and very pointed at apex, nearly as long as the preceding joints combined; labial palpi short and

stout, three-jointed, the first and last joints subequal, the middle one triangular, being extremely short on the inner side, and about one-half as long on the outer side as the apical joint.

Thorax strongly convex above, about one-third longer than wide; pronotum strongly arcuate; mesoscutum about twice as wide as long; axillae very short and acute, nearly or quite meeting medially; scutellum nearly as long as the scutum, very convex or pulvinate, the sides high and abruptly declivous, the apex rounded; propodeum very short medially, lengthening toward the sides and strongly declivous behind. Abdomen a little shorter than the thorax, strongly depressed, triangular; the cercal plates situated near or slightly basad of the middle; ovipositor sheaths not or barely protruded.

Legs about normal in length and structure; middle tarsi stouter than the hind pair, somewhat tapering, the first joint nearly as long as the following joints combined; the spur of the middle tibiae nearly as long as the first tarsal joint. Wings short and broad, strongly triangular; discal pubescence extremely short, fine, and rather dense, the basal area with coarser, sparser setae, the marginal fringe also short and dense; speculum indistinct above and broadly separated below from the posterior margin; submarginal vein reaching the costal margin before the middle of the wing, nearly uniformly arcuate from base to apex, slender throughout; marginal vein about twice as long as wide, and fully twice as wide as the submarginal; postmarginal wide at base, abruptly tapering, and about one-half as long as the marginal; stigmal very short, or no longer than the marginal, triangularly widened at apex, the base constricted. Hind wings wide, the costal cell practically absent.

Head and thorax microscopically reticulate, the reticulations of the frontovertex more or less thimblelike and interspersed with fine, shallow pin punctures; scutellum very finely striolate over a greater part of the surface or in part with minute thimblelike punctures; abdomen smoother and more shiny than the thorax, but nevertheless reticulate except on the first tergite. Eyes bare; head and thorax with numerous fine, short setae, which are seriately arranged on the mesoscutum and not conspicuously colored. General color submetallic black.

Male.—Very similar to the female, except in regard to the antennae; head considerably thinner frontooccipitally, the vertex broader, the ocelli larger; scape very short or no longer than the following three joints combined, clavate; pedicel no longer than thick, much shorter than the following joint; funicle joints over twice as long as wide, the first one slightly the longest, the others subequal, each flat beneath, convex above, except the sixth, which is much less so, and each with a scattered whorl of long curved setae; club narrowly oval, about as long as the last two funicle joints combined, two-

jointed in *californica* but entire in *saissetiae*, and with a few scattered setae which are shorter than the hairs on the funicle and decrease in length toward the apex.

GAHANIELLA CALIFORNICA, new species

Plate 1, fig. 6; plate 2, figs. 15 and 18

Female.—Antennal sockets about equidistant from the eyes and the oral margin; scape proper about three times as long as wide, pedicel nearly globular, club perfectly oval and rounded at base. Frontovertex somewhat more roughly scultpured than the rest of the head, with the reticulations somewhat thimblelike, the fine pin punctures rather numerous; scutellum finely striolate but becoming reticulate at apex, both mesoscutum and scutellum with numerous very minute setiferous punctures seriately arranged; propleura and prepectal plates comparatively coarsely and longitudinally reticulate, mesopleura finely reticulate, the propodeum smooth. Pubescence on head very fine, short, semiappressed, and although rather abundant on the lower part of the face and on the frontovertex, it is hardly visible except under high magnification; pubescence on mesoscutum and scutellum longer, but on account of its dark color it is not conspicuous; the apex of the scutellum mostly bare except for a pair of longer, more erect setae; pubescence of abdomen very fine and dark-colored above, being most abundant along the margins and at apex; the venter also rather densely pubescent with fine appressed hairs.

Coloration shining black, the frontovertex, thorax above, and the abdomen with a slight greenish luster, the scutellum a little duller; face, cheeks, and under parts of thorax somewhat bluish, mandibles brown; antennae brownish, the scape except the radicle and the pedicel except apical margin fuscous. Legs brownish to fuscous, the middle and hind femora inclining to brown; trochanters and front tibiae and tarsi yellowish brown; apex of middle femora, the middle tibiae at base and apex, apex of hind tibiae narrowly and the middle and hind tarsi pale yellow, the middle tibiae broadly and rather indefinitely brownish otherwise; the last joint of middle tarsi and last two joints of hind tarsi brown. Wings hyaline, the veins brownish with the marginal vein darker and more conspicuous than the rest of the venation.

Length of body, (1.26 to) 1.34; length of head, 0.459; width of head, 0.55; width of frontovertex, 0.254; length of antenna, 0.777; width of mesoscutum, 0.506; length of fore wing, 1.067; width of fore wing, 0.525 mm.

Male.—Very similar to the female in structure and coloration, but the head much thinner frontooccipitally, the frontovertex nearly twice as wide as long, the ocelli in an obtuse-angled triangle, the

antennae differing as noted in the generic description, the club two-jointed, the scape and pedicel dark brown, the flagellum pale brown.

Length of body, (1.12 to) 1.32; length of head, 0.457; width of head, 0.549; width of frontovertex, 0.271; length of antenna, 0.940; width of mesoscutum, 0.527; length of fore wing, 1.121; width of fore wing, 0.563 mm.

Described from two females and two males (holotype female, allotype, and paratypes) reared from a species of *Lecanium* (probably *L. corni*) on *Quercus californica* and from *Lecanium corni* Bouché on *Arctostaphylos*, July 29 to August 4, 1912, collected at Idyllwild, Strawberry Valley, San Jacinto Mountains, California, on July 12 and 13 (Timberlake), U. S. Insectary No. 14654 F and G.

Type.—Cat. No. 28145, U.S.N.M.

GAHANIELLA SAISSETIAE, new species

Plate 1, fig. 12; plate 2, fig. 17

Female.—Very similar to *californica*, but the following differences are apparent: Frontovertex a little wider in proportion to the length; the ocelli in an obtuse angle of about 95° or a little more; the face with an oval depression, apparently not due to shrinkage, divided medially by the antennal prominence, the scrobes not so distinctly sulcate, the prominence above the sockets tapering off to an ill-defined carina which separates the upper half of the scrobes; space between each antennal socket and nearest point of corresponding eye distinctly less than distance from the socket to the oral margin, the antennae being inserted slightly higher up on the face. Antennae a little longer, the scape narrower, more fusiform, excluding radicle a little over four times as long as wide; pedicel slightly longer than wide, and a little shorter than the following joint, the first three funicle joints a trifle longer than wide, the last three about as wide as long, club less perfectly oval and more truncate at base. Sculpture similar, but the reticulations of the frontovertex are more thimblelike and decidedly coarser, the fine pin punctures much sparser and fainter; the scutellum is microscopically shagreened with extremely minute thimblelike punctures which are longitudinally lengthened toward the base and gradually change to longitudinal striolations. Pubescence on head more conspicuous, as it is somewhat whitish and glistening, but considerably sparser on the frontovertex, where it is mostly confined to the orbits.

Coloration similar to *californica*, but with considerably more metallic luster in parts, the frontovertex much more distinctly greenish, the face and cheeks strongly bluish and rather brilliant, the facial impression greenish in some aspects; scutellum especially toward apex more or less bronzy; the declivous sides of scutellum, metapleura, and basal tergites of abdomen more or less shiny and

metallic greenish; base and apex of scape and apex of pedicel yellowish, the antennae otherwise as in *californica;* coxae and femora blackish, the hind femora with metallic luster, all trochanters yellowish, the front tibiae and tarsi pale brown, apex of front and middle femora, the middle tibiae excepting a broad fuscous ring at the middle, base very narrowly and apex of hind tibiae, and the middle and hind tarsi pale yellow, with only the tip of pulvillus of the apical joint of the tarsi dark; wings hyaline, the veins brownish.

Length of body (0.92 to) 1.30; length of head, 0.459; width of head, 0.532; width of frontovertex, 0.247; length of antenna, 0.803; width of mesoscutum, 0.523; length of fore wing, 1.079; width of fore wing, 0.518; length of ovipositor sheaths, 0.047 mm.

Male.—Similar to the male of *californica*, but differing in coloration and sculpture in the same way that the female does; antennae similar, the scape a little slenderer and more fusiform or widest near the middle, the first funicle joint longest, over twice as long as wide, third to fifth joints about twice as long as wide, the second and sixth joints a little shorter, the sixth a little more than half longer again than wide, club one-jointed, oval, pointed at apex, about as long as the last two and one-half preceding joints combined, the arrangement of hairs on the flagellum about the same.

Length of body, 0.91; length of head, 0.342; width of head, 0.390; width of frontovertex, 0.189; length of antenna, 0.685; width of mesoscutum, 0.368; length of fore wing, 0.833; width of fore wing, 0.404 mm.

Described from two females and one male (holotype female, allotype, and paratype) reared April 13–14, 1922, from *Saissetia nigra* (Nietner) at the experiment station, St. Croix, Virgin Islands, West Indies (C. E. Wilson).

Type.—Cat. No. 28146, U.S.N.M.

MAYRIDIA AMERICANA, new species

Plate 1, figs. 9 and 13; plate 2, figs. 21 and 21*a*

Closely allied to *M. bifasciatella* (Mayr), but differs in having the hyaline crossband of wings composed of two opposed triangular spots, the frontovertex of female twice as long as wide, the antennae of the male very much longer, etc.

Female.—Head thick frontooccipitally, the face inflexed; as seen from above the occipital margin is broadly and slightly arcuately emarginate, the sides obliquely rounded and somewhat converging toward the front, the head being widest close to the occipital plane, the frontal margin nearly transverse medially; as seen from in front a little wider than long, full rounded above, the dorsal surface of

head being strongly convex from side to side, but the cheeks subarcuately converge toward the broadly truncate oral margin; as seen from the side the outline of head is subtriangular, the occipital margin bulging moderately, the facial side nearly straight, about one-fourth longer than the dorsal side and meeting its plane in an angle of about 90°, the dorsal outline moderately rounded, sloping forward and downward, its angulation with the face rounded off. Occiput a little concave, the neck inserted near the center, its dorsal margin rounded; eyes moderately large, broadly subtriangularly oval, strongly diverging below in frontal vein of head, the posterior margin slightly emarginate, the facial margin about one-half as long as the dorsal margin and forming an obtuse rounded angulation with it; frontovertex less than one-third as wide as the whole head, nearly twice as long as its posterior width and slightly widening anteriorly; ocelli in an equilateral triangle, the anterior ocellus near the center of the frontovertex, the posterior pair about one-half their own diameter from the eye margin and remote from the occipital border; cheeks not short, yet considerably shorter than the width of the eyes, the genal suture very distinct; face very slightly convex from side to side, the antennal sockets situated nearly on the ocular line, more than twice their own length apart, distinctly closer to the eye margin than to each other and about equidistant from each other and the oral margin; scrobal impression above the sockets rather shallow, short, and semicircular, its margin not sharply angulated but vague, its cavity divided medially for about two-thirds of its length by the obscurely triangular prominence between the sockets.

Antenna hardly more than one-half as long as the body, moderately clavate; scape slender, a little compressed, slightly the widest near the middle, reaching for nearly one-half of its length beyond the scrobal impression; pedicel somewhat more than twice as long as thick at apex, distinctly longer than the following joint but not equal to the next two joints combined; funicle joints about equal in length but increasing considerably in width distad, the first longer than wide, slenderer than the pedicel, the second similar, but wider, the sixth nearly twice as wide as long; club pointed ovate, rounded at apex, as broad at base as the preceding joint and as long as the last three funicle joints combined, its three joints subequal in length.

Mandibles with three acute, nearly equal teeth, the apex a little oblique to the basal expansion but not so much that it can not be seen when the mandible lies flat. Maxillary palpi four-jointed, the third joint a little longer than thick, the second somewhat longer than the third, the basal joint about twice as long as the third, the apical joint nearly twice as long as the basal and slenderly fusiform; labial palpi three-jointed, stout, the basal joint the thickest and

longest, the other two about one-half as long, the apical one thinnest.

Thorax about twice as long as wide, only slightly convex above, the width distinctly greater than the depth; pronotum conical and visible in large part, its posterior margin arcuate; mesoscutum less than twice as wide as long; axillae moderately long at their outer ends, acutely meeting medially; scutellum somewhat shorter than the scutum, longer than wide in the apterous form and acute at apex, about as long as wide and more rounded at apex in the macropterous phase, the disk depressed, the sides abruptly declivous but not very strongly elevated; propodeum obliquely declivous toward apex, rather short medially.

Abdomen ovate, depressed, rather acute at apex, about as long as the thorax; the tergites not greatly unequal in length, the seventh longest medially, the third, fourth, and sixth shortest; cercal plates situated at the middle of the lateral margins; venter not compressed, ovipositor not inclosed apically by the ventrites, the sheaths just barely protruded.

Legs of normal length and structure, the middle tarsi stouter than the hind pair, tapering towards apex, the spur slightly shorter than the first joint. Wings generally rudimentary and reaching about to the apex of the propodeum, truncate at apex; when fully developed they are moderately wide and surpass the apex of abdomen, marginal fringe short; discal setae rather dense and fine, quite as dense on the hyaline median crossband but white and almost invisible when wing is mounted in balsam, much sparser and also hyaline in the clear area beneath the basal half of the venation; costal cell narrow, and with two or three rows of very fine, hyaline setae on the basal half; speculum distinct, strongly oblique, and widening below; submarginal vein nearly straight, marginal about four times as long as wide, the stigmal subequal to the marginal, only slightly widened toward the apex, the postmarginal about one-half as long as the stigmal; spur of the stigmal vein reaching about opposite to the middle of the costal margin.

Frontovertex finely punctulate, the punctures thimblelike, not quite uniform in size, being distinctly finer around the ocelli and interspersed with a few shallow pin punctures; face rather more finely reticulate; cheeks equally finely longitudinally reticulate-striolate; mesoscutum minutely scaly reticulate; scutellum densely longitudinally shagreened with alternate fine striae and broken lines, the axillae with a similar obliquely transverse sculpture; pleura smoothish, the propleura and prepectal plates finely reticulate, the mesopleura more finely and longitudinally reticulate; propodeum smooth; abdomen uniformly reticulate, except that the first tergite is smooth across the base, with the meshwork distinctly coarser than that of the mesoscutum or face.

Head with sparse, fine, inconspicuous pubescence on the cheeks and frontovertex, the face mostly bare, the eyes with a few erect extremely short setae; mesoscutum sparsely set with fine, pale-colored, seriately arranged setae, the scutellum with a few similar setae on the disk medially, and a pair of longer setae at apex; lateral margins of propodeum with a small patch of white pubescence; abdomen with sparse setae, mostly along the sides and at apex, but the basal tergite with a transverse row on each side not far from the apical margin.

General color rather dark aeneous green, the face and cheeks brighter green, with a brilliant golden luster or with a reddish luster at the oral margin and over a greater part of the cheeks; mesoscutum, apical margin of scutellum in certain aspects, and lateral margins of propodeum light metallic green, the axillae and remainder of scutellum much darker and duller; pleura and sternum of thorax, tegulae, propodeum, and lateral margins of mesoscutum, more or less widely and distinctly, yellowish brown to rather dark brown or even brownish fuscous, the propleura with a metallic luster; abdomen sometimes somewhat bluish black, but usually light green with a bright luster at the base. Antenna brownish yellow, the scape and club palest, the pedicel and funicle more or less embrowned. Legs brownish yellow, the apex of middle tibiae, spur, and middle tarsi palest, the hind femora and tibiae much darker or more or less brownish fuscous; a very narrow ring at base of hind tibiae and apex of the same more or less broadly pale; apical joint of all the tarsi fuscous. Brachypterous wing hyaline or whitish, sometimes a little infuscated at apex; macropterous wing rather deeply infuscated, but with the basal fourth and a band across the widest part just beyond the apex of the venation hyaline, the band composed of two subtriangular areas opposed at their apices; subbasal infuscated band extending from just beyond the middle of the submarginal vein to slightly beyond the apex of the stigmal vein, both its basal and its apical margin straight and transverse, but the band is somewhat interrupted by a curved subhyaline streak subparallel to the posterior margin and placed about one-fifth of the width of the wing from the margin; veins pale brownish yellow, with the apical half of the submarginal, the marginal, and postmarginal veins darker; hind wings hyaline.

Length of body, (1.48 to) 1.87; length of head, 0.495; width of head, 0.572; thickness of head, 0.292; width of vertex, 0.200; length of antenna, 0.874; width of mesoscutum, 0.481; length of macropterous fore wing, 1.496; width of macropterous fore wing, 0.606 mm.

Male.—Form much slenderer and less robust than in the female; head rather thin frontooccipitally; as seen from above transversely

subquadrate, the sides rounded, the margin in front broadly transverse, the occipital margin broadly slightly concave; as seen from in front broader than long, the curvature depressed above, strong on the sides dorsad, the cheeks arcuately converging toward the mouth; as seen from the side the facial outline is about straight and twice as long as the dorsal side, which is convex, the planes meeting in an obtuse angle, the occipital margin slightly bulging. Occiput moderately concave; eyes much smaller than in the female but similar in shape; frontovertex a little broader than long, its occipital margin rounded off; ocelli in a large, distinctly obtuse angle, the posterior pair remote from the occipital border and their own diameter from the eye margins, the anterior ocellus placed a little in front of the center of the frontovertex; cheeks wide and about as long as the width of the eyes, the genal suture distinct. Face moderately convex from side to side, with a very slightly elevated narrow ridge medially from the level of the antennal sockets nearly to the oral margin, a depression below antennae also present in some specimens, due to shrinkage; antennal sockets situated moderately far apart at the middle of the head, distinctly above the ocular line and hardly more than their own length from the rounded angulation between the face and frons, about their own length apart and slightly less than their own width from the eye margins; scrobes extremely short, extending obliquely inward and uniting, each about one-half as long as the sockets and together forming a shallow lunate depression slightly emarginated medially above.

Antenna slender, about three-fourths as long as the body, scape very short and stoutly fusiform yet reaching well beyond the scrobal impression; pedicel only slightly longer than thick, very much shorter than the following joint; flagellum long, slender, increasing very slightly in thickness distad, clothed with numerous uniformly distributed longish semierect setae, the first three funicle joints with a much longer curved seta at apex on the dorsal side; funicle joints all longer than thick, the basal joint cylindrical and by far the longest, about six times as long as thick and as long as the scape, the sixth slightly less than one-half as long as the first and somewhat less than twice as long as wide; club oval, entire, pointed at apex, and a little longer than the two preceding joints combined.

Thorax similar to the female but narrower, the mesoscutum relatively longer, scutellum longer than wide, rather acute at apex; abdomen depressed, ovate, about two-thirds as long as the thorax; wings fully developed and similar to the fully developed wings of the female.

Sculpture coarser but similar; frontovertex much more reticulate than in the female, or about like the face and with scattered shallow

pin punctures; mesoscutum almost as coarsely reticulate as the abdomen, the scutellum sculptured as in the female. Pubescence on the face and cheeks more abundant and conspicuous than in the female, yet rather sparse.

Coloration similar to the female, but the head is brighter green with a more brilliant luster, the face bright blue-green, the frontovertex with a variable reddish and golden luster; tegulae, propodeum and under parts of thorax shiny fuscous or black; scape about yellow ocher (Ridgway), the pedicel and flagellum pale brown; legs nearly uniformly yellow, about yellow ocher of Ridgway, the middle coxae fuscous except at apex, the front tarsi slightly dusky, the last joint of middle and hind tarsi fuscous; wings as in the female, but with the banding much fainter although distinct.

Length of body, (1.22 to) 1.53; length of head, 0.438; width of head, 0.492; thickness of head, 0.283; length of antenna, 1.13; width of mesoscutum, 0.433; length of fore wing, 1.33; width of fore wing, 0.558 mm.

Described from three females and one male (holotype female, allotype, and paratypes) reared from *Trionymus utahensis* (Cockerell) on *Elymus*, Salt Lake City, Utah, August 24 to September 20, 1915 (Timberlake); two males (paratype) from the same host and locality, April 13, 1911 (C. N. Ainslie), Webster No. 6650; one male (paratype) presumably from the same host on *Elymus condensatus*, Kimballs, Utah, August 13, 1912 (C. N. Ainslie), Webster No. 8823; four females (paratypes) from Tower City, North Dakota (G. I. Reeves), Webster No. 2559; and one female (paratype) reared from a mealy bug on *Elymus* at Tabor, South Dakota, August 8, 1913 (C. N. Ainslie), Webster No. 11801.

The females are all brachypterous except two from Tower City, North Dakota, and one of these has the fore wings very short, although the hind wings are fully developed. The males are all macropterous.

Another female reared by C. N. Ainslie from the same host at Salt Lake City, Utah, in September, 1912, apparently represents another species of *Mayridia*, as the head is much thinner and more obliquely inclined.

Type.—Cat. No. 28147, U.S.N.M.

EXPLANATION OF PLATES

PLATE 1

FIG. 1. *Vosleria signata* Timberlake. Antenna of female.
2. *Pseudorhopus hartmani* Timberlake. Antenna of female.
3. *Tachardiobius nigricans* Timberlake. Antenna of male.
4. *Tachardiobius nigricans* Timberlake. Antenna of female.
5. *Cyrtocoryphes viridiceps* Timberlake. Antenna of female.
6. *Gahaniella californica* Timberlake. Antenna of female.
7. *Vosleria signata* Timberlake. Head of female in frontal view.
8. *Aztecencyrtus flavus* Timberlake. Antenna of female. The shape of the club is hypothetical.
9. *Mayridia americana* Timberlake. Antenna of male.
10. *Hexacnemus armitagei* Timberlake. Antenna of female.
11. *Pseudorhopus hartmani* Timberlake. Antenna of male.
12. *Gahaniella saissetiae* Timberlake. Antenna of female.
13. *Mayridia americana* Timberlake. Antenna of female.

PLATE 2

14. *Pseudorhopus hartmani* Timberlake. Middle leg of female.
15. *Gahaniella californica* Timberlake. Antenna of male.
16. *Hexacnemus armitagei* Timberlake. Antenna of male.
17. *Gahaniella saissetiae* Timberlake. Antenna of male.
18. *Gahaniella californica* Timberlake. Venation of fore wing of female.
19. *Cyrtocoryphes viridiceps* Timberlake. Mandible of female in frontal view.
19*a*. *Cyrtocoryphes viridiceps* Timberlake. Mandible of female in ventral view.
20. *Hexacnemus armitagei* Timberlake. Venation of fore wing of female.
21. *Mayridia americana* Timberlake. Mandible of female in dorsofrontal view.
21*a*. *Mayridia americana* Timberlake. Mandible of female in dorsal view.
22. *Aztecencyrtus flavus* Timberlake. Mandible of female in frontal view.
22*a*. *Aztecencyrtus flavus* Timberlake. Mandible of female in ventral view.
23. *Hexacnemus armitagei* Timberlake. Mandible of female in frontal view.
23*a*. *Hexacnemus armitagei*, Timberlake. Mandible of female in dorsal view.
24. *Tachardiobius nigricans* Timberlake. Mandible of female in frontal view.
24*a*. *Tachardiobius nigricans* Timberlake. Mandible of female in dorsal view.

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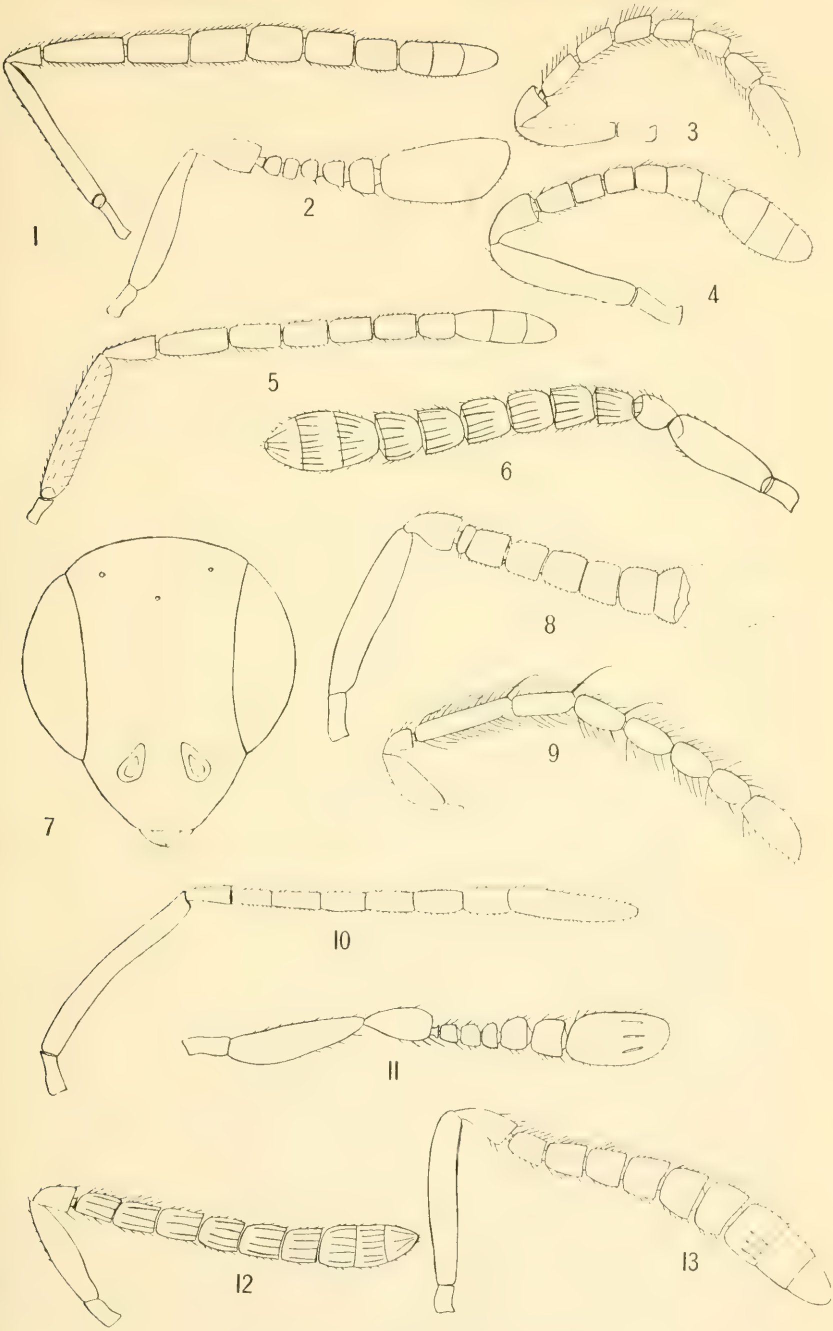
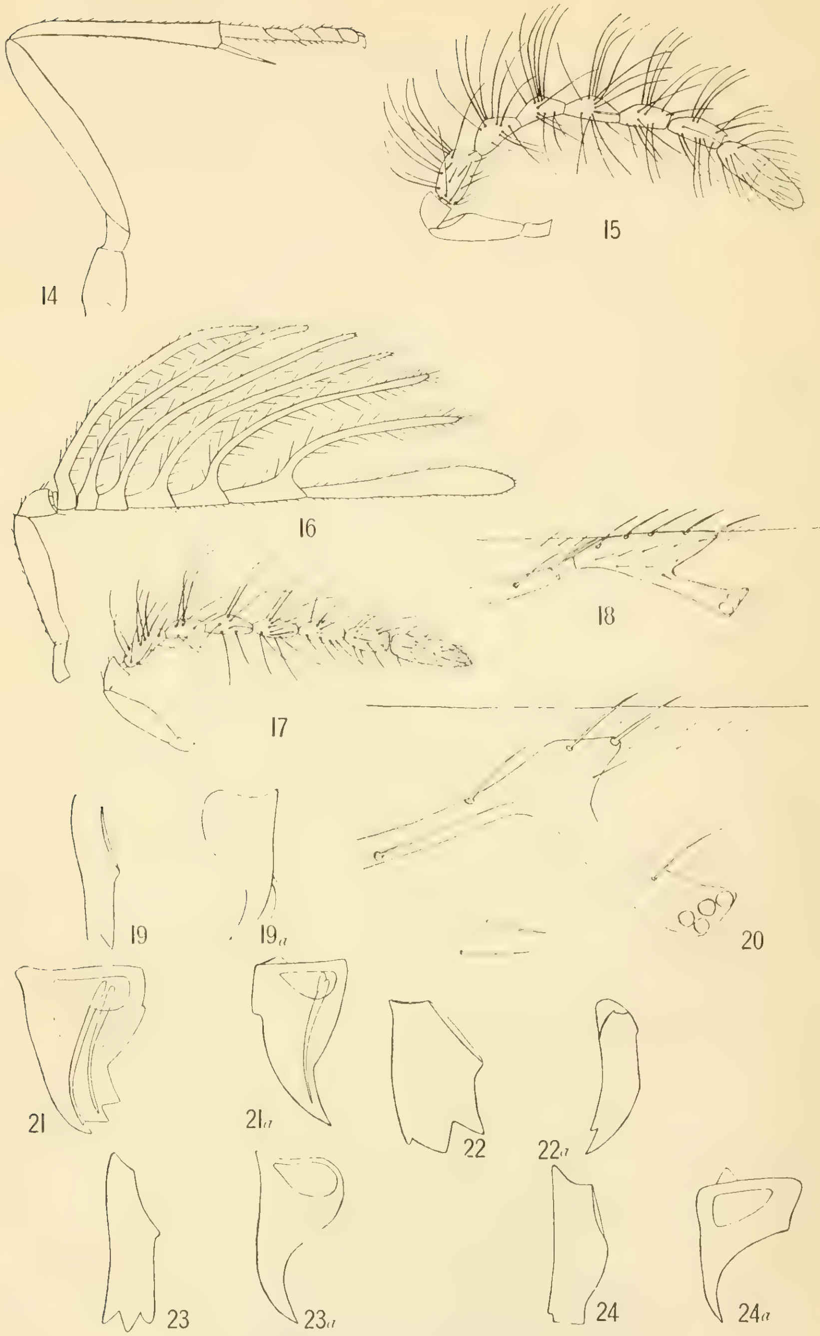


DETAILS OF NEW CHALCID-FLIES

FOR EXPLANATION OF PLATE SEE PAGE 34



DETAILS OF NEW CHALCID-FLIES

FOR EXPLANATION OF PLATE SEE PAGE 34

THE COLLECTION OF ANCIENT ORIENTAL SEALS IN THE UNITED STATES NATIONAL MUSEUM

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The collection of oriental seals in the United States National Museum consists of about 90 originals with the flat plaster casts made of them, with upwards of 200 casts of seals which were lent to the Museum by their several owners for the purpose of obtaining casts of them, which were made in the laboratories of the Museum, the owners receiving in return a set of the casts. The selection reproduced and described in this paper is fairly representative of the artistic types and the engraved mythological subjects of the seals in the collection.

INTRODUCTION

FUNCTION OF THE SEAL IN THE ORIENT

The use of seals was of great importance in the everyday life of the ancient world. They served the purpose of our locks and keys to secure property from the attack of thieves.[1] There have been found in Babylonia and Egypt pats of clay with the impression of a seal on them and with the mark of the cord around which it was laid, the cord having evidently been tied about some valuable object; also stoppers of jars, made of bitumen, mixed probably with clay, on which seals have been impressed. But more important was the use of seals to authenticate and validate legal documents, such as sales, leases, loans, contracts, and wills. The seal was a guarantee for the validity of a document on the part of the person or persons who yielded certain rights or who took obligations on themselves.

In addition to this the seal also served as a protection against alterations of or additions to a document. The statement of Herodotus (i, 95) that everyone in Babylonia carried a seal is thus confirmed by the large number of seals found and their impressions on

[1] "Locks and keys are comparatively modern inventions, for the most ancient ones in Egypt are not older than the Roman period." Percy E. Newberry, Egyptian Antiquities, Scarabs, 1906, p. 5.

numerous Babylonian inscribed clay tablets. The individual who did not possess a seal made a thumb-nail mark in the soft clay, which was the writing material of Babylonia, alongside of which the scribe usually wrote "thumb-nail mark of NN" and sometimes adding his name.[2] Even at present the importance attached to the seal in the East is so great that without one no document is regarded as authentic.[3]

Alongside of their legal function it may be assumed that the seals, engraved with the figures and symbols of gods, also served as amulets to protect against evil spirits. It is even thought by some Assyriologists that this object was the primary and original one.[4]

And lastly, in connection with their more serious purposes, they were also worn as ornaments.

HISTORY AND DEVELOPMENT OF THE SEAL

The art of stone engraving has been practiced in the Valley of Mesopotamia since the archaic period. The ruins of Nippur (modern Niffer), Lagash (modern Telloh), and of other sites have preserved examples on plaques of large dimensions. But it was above all developed on the seals which were in use from the earliest time down to the Persian period. It is estimated that about 10,000 ancient oriental seals are now in museums and private possession, and the seals dated from the dynasty of Akkad (about 2,800 B. C.) exhibit such an artistic excellence and vigor of execution, never reached afterwards, that a long development of the glyptic art in Babylonia must have preceded them.

It is an unsettled question whether the flat or stamp seal or the cylinder was the earliest form of seal in Mesopotamia. The vast majority of original seals and of impressions of them on clay stoppers, and especially on clay tablets, are in the form of cylinders. If the cylinder superseded the more convenient flat seal, the reason might perhaps be that the former offered a larger surface for the engraving of a design. The classical land of the cylinder seal is Babylonia, where it is found from the earliest time, at least from the end of the fourth millennium B. C. down to the fall of the Neo-Babylonian empire (538 B. C.). There the cylinder form of seal

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[2] Compare Albert T. Clay, Light on the Old Testament from Babel, 1907, p. 174. The seal-impressing of tablets became customary in the time of the Kings of Akkad (Sargon I and Naram Sin, about 2800 B. C.); it became frequent in the time of the Kings of Ur (about 2400 B. C.), and reached its greatest extension in the Hammurabi period (about 2000 B. C.). Under the Neo-Babylonian empire (605 B. C.) it becomes rare. Otto Weber, Altorientalische Siegelbilder (Der Alte Orient), 1920, p. 4.

[3] For the use of seals by the Hebrews in biblical times, see I Kings xxi, 8, and Jeremiah xxxii, 9.

[4] Compare Otto Weber, Daemonenbeschwoerung bei den Babyloniern und Assyrern (Der Alte Orient, 7, 4), 1906, p. 35; Morris Jastrow, The Religion of Babylonia and Assyria, 1898, p. 672.

was for many centuries the only one in use, and so deeply rooted that long after the fall of Babylon its heirs, the Persians, continued to use it alongside of the flat seal.

The cylinder seals vary in size from two to three-fifths of an inch in diameter, and from three-quarters of an inch to an inch and a half in length. Some are as much as one and three-quarters or even two inches long, but they are quite exceptional. In some of the early Babylonian cylinder seals the surface on which the device was engraved is more or less concave (pl. 1, No. 1*d*), approaching in shape a hollow spool. The probable reason for this is that the tablet was usually convex on its surface and the cylinder was made concave to fit it. In the later period the cylinder itself became convex or barrel shaped (pl. 1, No. 1*c*). But as a rule the surface of the cylinder seal is parallel to the axis. The cylinders are usually pierced lengthwise through the center, presumably for the purpose of inserting a swivel that would enable them to be rolled over the clay, and also to pass through a thread by which they might be suspended from the neck or wrist.

At the beginning of the first millennium, B. C., appears or reappears, as the case might be, in Assyria the more practical and convenient flat seal and gradually also passed into Babylonia, being used in both countries alongside of the cylinder. It has frequently the form of a truncated cone or pyramid, rounded at the top, with an elliptical and somewhat convex base for receiving the device. Sometimes the section approximates a parallelogram with truncated angles. It was pierced near the top for a string or wire. So that under the last kings of Assyria, and still more during the second Babylonian Empire (605–538 B. C.) and the Achaemenian kings of Persia (538–334 B. C.) both cylinders and cones may have been produced in the same workshop. Later, under the Seleucides (since 312 B. C.) and the Sassanides (since 226 A. D.) the cone or pyramidal seal was flattened more and more into a spheroid and scaraboid until it assumed the shape of a heavy ring, and the cylinder ceased to be used.

Comparatively few tablets, and those of the Persian period, are found sealed with flat seals. In a number of cases the impressions of both the cylinder and the flat seal of an individual are stamped on documents (pl. 1, Nos. 1 and 2).

The oldest seals that have been discovered in Egypt are likewise cylinder seals, ranging in size from half an inch to three and a half inches in length, and from a quarter of an inch to three-quarters of an inch in diameter. The history of the cylinder seal in Egypt goes back to predynastic times, and it was in general use down to the twelfth dynasty (2,000–1,788 B. C.), when it was mostly susperseded

by the engraved scarab, though as an archaism it was not wholly discarded there as late as the twenty-second dynasty (945–745 B. C.).[5]

It has been ingeniously suggested that the form of the two great groups of seals was derived from a small scratched pebble and a piece of notched reed, respectively; the first was the original of the stamp seal (cone, scarab, etc.), the second the prototype of the cylinder seal, for nothing would be simpler than to take a short section of a reed and cut on it one's own private mark. This reed then gave shape and design to the permanent stone cylinder seal, pierced like the reed through its axis of length. The step between cutting one's private mark upon a section of reed and replacing such a material with an engraved stone cylinder was a short one.[6]

"The earliest printing press," remarked Doctor Ward, who had made the study and elucidation of oriental seals his special field, "was a seal, and the cylinder seal may be said to have been an archaic rotary press."[7] And Newberry adds: "From the invention of the simple seal to the complex printing press with its movable types appears a long way to travel, but that we have the germ of this great invention in the simple seal is obvious when we come to think of it. The old Egyptian or Babylonian who first took the impression of his signet on a lump of plastic clay, had discovered the principle of printing, though it took the human mind many hundred years before the next great step was taken, that of smearing some black or colored substance upon a seal and taking a 'print' of it on plaster and in ink on a papyrus."[8]

MATERIAL OF THE SEALS

The material of which seals were made cover a large variety. The earliest seals, prior to the kings of Akkad (about 2,800 B. C.) were of soft material, as the columella of certain shells picked up on the shores of the Persian Gulf, bone, ivory, alabaster, marble, serpentine, and steatite. Lapis-lazuli was a favorite material from the earliest period. Later, about the middle of the third millennium B. C., harder materials, as rock crystal, jasper, saphirine, and others appear. Hematite was the most common stone used for the seals of the common people. The Assyrian seals, both cylinders and stamps, are largely of fine material, or what is termed semiprecious stones, such as chalcedony, carnelian, and onyx, but also seals of composite mass (false lapis-lazuli) occur.

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[5] Compare P. E. Newberry, Scarabs, p. 43, and William Hayes Ward, The Seal Cylinders of Western Asia, 1910, p. 1.

[6] Compare C. W. King, Handbook of Engraved Gems, 1885, p. 4; Newberry, Scarabs, p. 11; Ward, The Seal Cylinders of Western Asia, p. 4; and Scribner's Magazine, January, 1887, p. 80.

[7] W. H. Ward, Scribner's Magazine, January, 1887, p. 80.

[8] P. E. Newberry, Scarabs, p. 11.

TOOLS USED FOR ENGRAVING AND PIERCING OF THE SEALS

The early seals were cut with the free hand. The employment of the drill and the wheel can not be established before the middle of the second millennium B. C. Seals in soft material, such as shell, marble, serpentine, etc., could have been engraved with a sharp flint point.[9] It is difficult to say when the use of metal tools set in. But the hard stones which already in the time of the dynasty of Akkad (2,800 B. C.) were used for seals, as also the piercing of the oldest stone cylinders, is scarcely thinkable without metal tools. The main tool used may have been that named in Jeremiah xvii, 1, a metal stylus, tipped with a diamond splinter.[10] With the discovery of the wheel and drill, the art of gem cutting progressed with the development of the means of expression, as exhibited in the seals of the last Assyrian and Babylonian kings. The tools used were a burr to make small holes, such as dots for stars or the knee and shoulder joints of human figures, a round disk, the edge of which, like a circular saw, would cut a straight line, deeper in the middle, and a round hollow tube, the end of which would make a circle or, if applied at an angle, a semicircle or crescent. The turning of the wheel and drill may at first have been worked by the hand, and in the latest period revolved by the attachment of a wheel which was set in motion with the foot. The piercing of the cylinders was probably done with some metal rod, rolled by the hand or revolved with the aid of the string of a bow. The perforation was worked from both ends, as in some seals a slight projection may be noticed inside in the center. It would seem then that nearly all the work had been done with only two instruments—one for round hollows and other for lines, probably using with the tools some hard friable material as emery or corundum.

The cutting on all ancient seals is in intaglio, which is the earliest form of engraving on hard stone in every country.

The work of seal engraving is mentioned as a distinct occupation in Ecclesiasticus (Sirach) xxxviii, 27.

DESIGNS ENGRAVED ON THE SEALS AND THEIR ARTISTIC FEATURES

The designs engraved on the seals are almost always mythological and religious. Profane subjects are few and belong to a late period. Scenes from industrial life are very rare; husbandry and

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[9] Herodotus, VII, 69, describing the arrows of the Ethiopians in the army of Xerxes, says: "They were tipped with a stone, which was made sharp, and of that sort with which they engrave seals."

[10] "The Mexicans are reported to have managed to cut the hardest rocks and to engrave finely upon the emerald with nothing but bronze tools. * * * The Peruvians also succeeded in piercing emeralds without iron. Their instrument is said to have been the pointed leaf of the wild plantain, used with fine sand and water. With such a tool the one condition of success was time." Georges Perrot and Charles Chipiez, History of Art in Ancient Egypt, 1883, vol. 2, p. 288, n. 3.

agriculture are more frequently represented, while scenes from war and the chase are comparatively numerous and are almost exclusively confined to Assyrian and Persian products. From the seals we obtain an insight into the manner in which the peoples of the ancient Near East represented their gods and goddesses. The rich symbolism of the cult also finds illustration in the various designs, and the current myths and popular tales are revealed to us in a most graphic manner. They thus supply an invaluable source of information as to the earliest religious ideas and history of the Babylonians and of the peoples that drew their culture from them. Many of the subjects engraved on seals meet us again on the sculptured walls of the temples and palaces of Babylonia and Assyria, and it may be that the seal impressions suggested the idea of decoration on bas-reliefs; on the other hand, the repertory of the sculptor may not have been without influence on the seal engraver.

A large number of cylinder seals of the earliest periods show a contest with wild beasts—lions, bulls, ibexes, gazelles, antelopes, combining symbolism with realism. No two are exactly alike. These scenes are closely allied with or derived from the episode of the exploits of the great hero, Gilgamesh (formerly called Gishtubar) and his companion, Enkidu (formerly Eabani). Gilgamesh is the central figure of the great Babylonian epic which has been termed the "Nimrod Epic," because the hero has been considered to have been the prototype of Nimrod the "mighty hunter before the Lord" mentioned in Genesis x, 10. He is described in the Epic as being two-thirds god and one-third man, a strong and valiant hero, ready for a fight, while his friend, Enkidu, is depicted with the upper part of a man and the lower of a bull, with a horned headgear, indicating his divine nature. These two heroes frequently appear in combat with wild animals, Gilgamesh usually engaging a wild bull, Enkidu, a lion. This episode of the epic is depicted on the seals in numerous variations. The battle scenes are sometimes merely adjuncts, to fill out space, to a religious or ritual scene, representing a suppliant being led up by a priest or by his tutelary deity to one of the great gods sitting on a throne (pls. 1 and 2).[11]

Another theme, not found on early Babylonian cylinders, but frequent in the Assyrian period, is the fight between the god Marduk

[11] O. Weber, Daemonenbeschwoerung, p. 35, surmises that the scenes of the conflict of a god or hero with some monster had an amuletic significance, inasmuch as they deal with the overcoming of a hostile power, and so indicating that the patron or tutelary deity was always ready to fight against the attacks of a hostile demon. Also the scenes representing a worshiper led to a god may be those in which a priest leads a sick person to the deity to free him from the demon who caused the disease. And in his Altorientalische Siegelbilder, p. 79, he would ascribe to these conflicts a cosmic import; the origin of the world, he says, is conceived by the oriental as a battle between the gods and primitive forces which assume the form of animals, so that the conqueror of the animal represents the triumph of the creator of the world over the chaos.

(Merodach) and the dragon Tiamat, taken from an early cosmogonic story of the conflict between order and disorder at the creation of the world. Tiamat, symbolizing chaos, is usually represented as a griffin or composite monster.[12] Marduk attacks her with a scimitar or crooked sword, a dagger, or with bow and arrow.

Another subject frequently represented in many variations is that of the "Sacred Tree" or "Tree of Life." Like the fight between Marduk and Tiamat, it belongs to the north. It is distinctly Assyrian in type, but it is also found to some extent in Persia and Syria. Sometimes winged genii, holding a cone and a basket or pail, are seen on either side of the tree, or a king accompanied by an eagle-headed winged genius; sometimes a priest of Ea, the god of the deep, clad in fish scales (identifying himself with the god) is in attendance. On some of the seals of this group the standard of the god Ashur, consisting of the winged sun disk with the bust of the god in the center, hovers over the tree. The conventionality is manifested here in a pronounced degree as to give to the tree most fantastic forms. In fact the meaning of this theme is still obscure. The general assumption is that it symbolizes the fertilizing of the date palm (pl. 5[13]).

Of the gods represented on the cylinders Sin, the moon god, and Shamash, the sun god, are the ones most frequently selected. Sin is often indicated by the crescent of the moon over or near his figure. Shamash is represented as a majestic figure, seated on a throne, or stepping over a mountain, or passing through gates, symbolizing sunrise. Frequently also rays or streams are depicted as issuing from his shoulders, symbolizing, respectively, the beneficient warmth of the sun and the fertilizing water, which are within the province of the great orb and which are so essential to life. Next to these great gods, Ishtar, the goddess of love and fecundity, and Adad (Hadad) or Raman ("the thunderer"), the god of storm, often appear on the seals.

On the flat or stamp seals usually a solitary figure, priest or suppliant, stands praying with raised hands before an altar or column which is surmounted by the emblem of some god (pl. 6, No. 5).

Not all events and objects pictured on the seals necessarily have a meaning. The Mesopotamian artists seem to have been affected

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[12] Only on two seals extant is Tiamat represented as a serpent, one is in the Metropolitan Museum of Art in New York (a cast of which is on exhibition in the National Museum, see pl. 3, No. 1), the other in the British Museum in London. Doctor Ward, Seal Cylinders, p. 202, remarks: "We may conjecture * * * that it was directly from them that the Israelites got the story of the serpent tempter" (pls. 3 and 4).

[13] Compare Edward R. Tylor in Proceedings of the Society of Biblical Archaeology, vol. 12 (1889–90), p. 383, especially p. 388. Another plausible interpretation of this frequent scene on Assyrian sculptures is that the figures are plucking the fruit of the Tree of Life. Compare Benjamin W. Bacon in the Annual of the American School of Oriental Research, vol. 5, for 1923–1924, pp. 12 and 18.

by the *horror vacui*, and their art is often exhausted in merely filling the space with the familiar types of deities and emblems without much pains to select them. Moreover, to secure pictorial effect, reality is often sacrificed to symmetry. Gods and animals are very often so arranged as to balance each other, and for this purpose a god or other object is often repeated.

Less than half of the seals have on them inscriptions. They very frequently bear little reference to the figures. In the Kassite period (about 1750–1174 B. C.) the inscription was extended to a short prayer and crowded out the picture, reducing it to a single figure (pls. 20, No. 8, and 14, No. 5).

DESCRIPTION OF THE SPECIMENS FIGURED IN THE PLATES

PLATE 1

1. Original cylinder seals. Natural size.
   a. Chalcedony. Hillah, Mesopotamia. (Cat. No. 207924, U.S.N.M..)
   b. Hematite. Engraved in two registers. Hillah, Mesopotamia. (Cat. No. 207938, U.S.N.M.)
   c. Lapis-lazuli. Barrel-shaped. Hillah, Mesopotamia. (Cat. No. 207941, U.S.N.M.)
   d. Jasper. Concave. Hillah, Mesopotamia. (Cat. No. 207921, U.S.N.M.)
   e. Carnelian. Hilliah, Mesopotamia. (Cat. No. 207901, U.S.N.M.)
   f. Hematite. Hillah. (Cat. No. 207,960, U.S.N.M.)
2. Original flat or stamp seals. Natural size.
   a. Spheroid. Chalcedony. Vicinity of Baghdad, Syria. (Cat. No. 158358, U.S.N.M.)
   b. Scaraboid. Chalcedony. Asia Minor. (Cat. No. 158362, U.S.N.M.)
   c. Cone. Chalcedony. Hillah, Mesopotamia. (Cat. No. 207942, U.S.N.M.)
   d. Ringstone. Chalcedony. Asia Minor. (Cat. No. 158370, U.S.N.M.)
   e Spheroid. Hematite. Asia Minor. (Cat. No. 158414, U.S.N.M.)
3. Gilgamesh and Enkidu in battle with the divine bull and the lion, respectively. Both heroes are represented *en face*, bearded and nude, wearing the horned tiara, indicating their semidivine character. The lower part of Enkidu is of an animal. One line of inscription. The original of schist, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207907, U. S. N. M.) See above p. 6.)
4. Gilgamesh and Enkidu. The representation of the two heroes is the same as in No. 3. But here the roles are changed. Gilgamesh is attacking the lion and Enkidu the bull, grasping it by the hindlegs with head down. Two lines of inscription. The original of jasper, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207921, U.S.N.M.)

PLATE 2

1. Battle of Gilgamesh and Enkidu with the bull and lion. Enkidu grasps the forelegs of the lion, while Gilgamesh, with his head turned to the right, holds with the left hand one of the forelegs of the bull, with the right he seems to wield a club. At the other end is perhaps a repetition of Gilgamesh attacking another animal (leopard?). In the field, between Enkidu and the lion, is a club or the arrowheaded column (*ashera*) of Marduk. The original of mixed diorite Bagdad, Mesopotamia, is owned by Prof. H. Hyvernat. (Cat. No. 300577, U.S.N.M.)
2. Gilgamesh and Enkidu in battle with the lion and bull. The animals are in the center, the heroes at the ends. The original of greenstone from Aintab, Syria, is owned by Dr. Frederick Stearns. (Cat. No. 158432, U.S.N.M.)
3. Contest with fantastic animals. In the field the winged disk symbolizing the god Ashur and the column of the god Marduk. The original of schist from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207928, U.S.N.M.)

4. Gilgamesh is holding the bull by the hind legs and his right foot on the head of the bull, while Enkidu is engaging the lion. In the field, two small figures in antipodal position; four dots—the four winds or four points of the compass (?) —; a crook placed on a tiny dog (the animal of the goddess Gula or Bau), and between Enkidu and the lion, a fish (which may be connected with Nina, a fish goddess, or with Nineveh, in Assyrian, Ninua, the fish city). The original of chalcedony is owned by Mrs. Talcott Williams. (Cat. No. 311263, U.S.N.M.)
5. Contest with monsters. In the main the scene represents a single hero (man or deity) fighting a single animal. The second animal is loosely related to the composition. The original of chalcedony from Bagdad, Mesopotamia, is owned by Prof. H. Hyvernat. (Cat. No. 300593, U.S.N.M.

PLATE 3

1. Marduk fighting Tiamut, the personification of chaos and disorder. Tiamat is here represented as a long serpent with horned head. (See above, p. 7, and note 12.) The god thrusts at the serpent's mouth with a lance or scimitar weapon. There is a kneeling worshipper, perhaps the owner of the seal, and probably an attendant deity or priest. In the field, crescent, the symbol of Sin, the moon god; rhomb or oval, which is perhaps a conventionalizing of the eye, so frequent in Egyptian symbolism,[14] seven dots (one missing), which are interpreted to stand for the seven Igigi, the spirits of heaven, or the pleiades (sun, moon, and the five planets), and two small trees—to fill out space. This seal has had quite a history. The original, probably of serpentine, was bought by the Rev. W. Frederick Williams from an Arab who had come over the river from Layard's diggings near Mosul in 1857. It passed into the hands of Prof. Frederick Wells Williams, from him to Dr. William Hays Ward, and then to the Metropolitan Museum of Art in New York. (Cat. 158319, U.S.N.M.)
2. Tiamat is here represented as human-headed, winged sphinx with body of a lion, on the left side as a male sphinx, on the right as a female sphinx. The doubling is for the sake of symmetry. In the field, a star, the emblem of Ishtar, the goddess of fertility. The original is unknown. (Cat. No. 168976, A, U.S.N.M.
3. Marduk with bow, quiver, and ax attacks Tiamat, represented with head and forelegs of a lion, hind legs of an eagle, body covered with feathers, wings and short tail. The god stands upon another smaller dragon with scorpion tail, crouching, and shoots his three-pronged arrow of lightning at the monster. In the field, the winged disk of the god Ashur, the crescent of Sin, the moon god, and the star of Ishtar. Below, a fish, two rhombs (for which see No. 1), and a palmette (the sacred tree). The original of greenish serpentine is in the Metropolitan Museum of Art in New York. (Cat. No. 130285, U.S.N.M.)
4. Marduk attacking Tiamut with the scimitar. Behind is the tree of life surmounted by the winged disk of Ashur. In the field on the right, above, lamp, symbol of Nusku, the fire god, below, the rhomb. The original of chalcedony is owned by Prof. H. Hyvernat. (Cat. No. 300605, U.S.N.M.)
5. Marduk with bow and sword pursuing Tiamat, represented as winged dragon with horned head, forelegs of a lion and hind legs of an eagle. Two worshippers, one kneeling under the winged disk of Ashur. In the field, seven dots (see pl. 3, no. 1), and the rhomb. Original of chalcedony is in the Metropolitan Museum of Art in New York. (Cat. No. 130287, U.S.N.M.)

[14] Compare Ward, The Seal Cylinders of Western Asia, p. 410.

6. Marduk in low cap, four winged, with left foot raised against Tiamat, who is represented with head of an eagle, wings and feathered body, grasps with the left hand one of the wings of the monster, while his right hand, holding the scimitar or crooked sword, hangs down. Tiamat stands on the hind legs with head turned back. Behind is the tree of life surmounted by the sun wheel. Two lines of inscription. The original of chalcedony from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207937, U.S.N.M.)

Plate 4

1. Battle of Marduk with Tiamat continued. The latter is represented on one side as a winged, eagle-headed griffin with scorpion tail, on the other as a winged sphinx. Marduk, four winged, seizes them by one of the forelegs. In the field, above, the winged disk of Ashur, below, a dog and the head of a bull, the animal of the storm god, Raman or Adad. The original of quartzite onyx from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207956, U.S.N.M.)
2. The same as the last one, only that in the field below the upper part of the horned dragon, the animal of Marduk, takes the place of the head of a bull. The original of porphyry from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207940, U.S.N.M.)
3. Tiamat is represented as a winged, bearded sphinx. Marduk, four winged, uses as weapon the thunderbolt (?). In the field, the winged disk of Ashur, a fish, and a small tree. The original of jade from Aintab, Syria, is owned by Frederick Stearns. (Cat. No. 158433, U.S.N.M.)
4. Probably a hunting scene. A man with bow attacking some quadruped. In the field, above, crescent, sun, or star, and seven dots (pl. 3, No. 1); below, a small tree, to suggest the open country. The original of steatite from Aintab, Syria, is owned by Frederick Stearns. (Cat. No. 158439, U.S.N.M.)
5. Hunting scene: Man chasing antelopes. The original of steatite from Aintab, Syria, is owned by Frederick Stearns. (Cat. No. 158428, U.S.N.M.)
6. Contest with some animals. The original of black stone from Aintab, Syria, is owned by Frederick Stearns. (Cat. No. 158438, U.S.N.M.)

Plate 5

1. The sacred tree, or tree of life, surmounted by the symbol of the god Ashur, worshipped on one side by a priest, on the other by the man-fish, or god or genius clad in a fish skin, holding a basket (but no fruit). Behind the human worshipper is, for the sake of symmetry, another man-fish with basket. The original of chalcedony from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207924, U.S.N.M.) (See above, p. 7.)
2. The tree of life, surmounted by the emblem of Ashur, between two worshippers. In the field, crescent (moon god), seven dots (pl. 3, No. 1), rhomb, and perhaps the lamp of Nusku, the fire god. Drill work. Original unknown.
3. Lion and hind (?) climbing up a peculiarly shaped tree. Behind the lion is a man (or god) in low round cap and short tunic grasping the lion's head with his left hand, while with the raised right hand he wields some weapon. Perhaps Persian hunting scene. The original of jade from Baghdad, Mesopotamia, is owned by Prof. H. Hyvernat. (Cat. No. 300598, U.S.N.M.)

4. Two worshippers in long robes, low turbans, with hair looped behind, standing in the attitude of adoration before the tree of life which is surmounted by the winged disk of Ashur. In the field, the star of Ishtar and a fallow deer. The original of chalcedony from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 209957, U.S.N.M.)
5. In the center, the tree of life surmounted by the emblem of Ashur. On the left side a kneeling worshipper in low cap, on the right, an ibex. In the field, crescent (the moon god, Sin), and the star of Ishtar. The original of clouded agate is in the United States National Museum. (Cat. No. 130106, U.S.N.M.)
6. Three divinities. The two at the ends have rays issuing from their shoulders, the one at the right holds a scepter, perhaps Shamash, the sun god; on the left end may be Ishtar, to whom the star over the head may be pointing. The god in the middle may be Nebo (Babylonian, Nabu) or Marduk. Between them is the tree of life. In the field, above, crescent (Sin), the seven Igigi or Pleiads and stars; in the middle, rhomb; below, the columns of Marduk and Nebo, respectively. The original of hematite is owned by Mrs. Talcott Williams. (Cat. No. 311262, U.S.N.M.)
7. Marduk standing on his animal, the horned dragon. Before him a worshipper in long robe in the attitude of adoration; behind, the tree of life surmounted by the winged disk of Ashur. In the field, crescent (Sin, the moon god). The original of chalcedony from Baghdad, Mesopotamia, is owned by Prof. H. Hyvernat. (Cat. No. 300602, U.S.N.M.)

PLATE 6

1. Lion attacking an antelope from behind, both animals standing on their hind legs. On either side of them is a man, or Deity, battling the animals. The antelope is grasped by the forelegs, while the other figure has taken hold of the lion's tail. The figures wear low caps and belts for clothing. The original of lapis-lazuli from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207931, U.S.N.M.)
2. Shamash, the sun god, stepping with the right foot over a mountain, symbolizing sunrise, and holding a scepter; before him a worshipper carrying a kid for a sacrifice, introduced by a priest or another deity. The other scene represents Gilgamesh fighting the lion (see p. 7). The original of hematite from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207935, U.S.N.M.).
3. The same as the preceding, only that here Enkidu takes the place of Gilgamesh and the introducing god or priest is omitted. In the field, above, crescent (Sin, the moon god); below, some small animal climbing up the god from behind; between the lion and Enkidu, a nude small figure which is assumed to represent Zirbanit, the spouse of Marduk. The original of hematite from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207915, U.S.N.M.)
4. Above, the winged disk with the heads of Anu, the Babylonian god of heaven, Bel, the god of the earth, and Ea, the god of the water deep. On the left side, sun (Shamash) or star (Ishtar) in crescent (Sin); on the right, the columns (asheras) of Nebo and Marduk, respectively; in the middle, the Egyptian symbol of life (ankh) reversed (compare W. H. Ward, The Seal Cylinders of Western Asia, p. 395). The original, a cone of chalcedony, from Aintab, Syria, is owned by Frederick Stearns. (Cat. No. 158416, U.S.N.M.)

5. Worshipper before the column of Marduk, which rests upon an altar. Above, star (Ishtar). The original, a cone of chalcedony, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207931, U.S.N.M.)
6. God, probably Sin, the moon god, as suggested by the crescent above, seated; before him a worshipper in long robe; below them some small animal is creeping into the lap of the god. Behind the worshipper a lion on his hind legs. Three lines of inscription separate the lion from the god. The original of brown hematite from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207906, U.S.N.M.)
7. Ishtar in her character as goddess of war ("Ishtar of Arbela," in contradistinction from "Ishtar of Nineveh," as goddess of love and fertility) in conical headdress, with right foot on her bird, the dove, holding in her right hand the Babylonian caduceus;[15] in the left, the crooked sword or scimitar, common to her and Marduk. From her shoulders rise sheaves of clubs. A small animal—monkey (?)—is climbing up to the goddess. At her right is Raman, the storm god, in low cap and short tunic, holding in his left hand an ax or hammer with the right arm bent against his side. On the other side is a repetition of the figure of Raman with Shala, his spouse, in long flounced robe and conical headdress in the attitude of adoration, with a small figure in short tunic between them. Two lines of inscription separate the two scenes. The original, of porphyry, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207926, U.S.N.M.)
8. Ishtar standing in a circle of rays which terminate in dots (stars). The original, a scaraboid of chalcedony, is owned by Frederick Stearns. (Cat. No. 158362, U.S.N.M.)

PLATE 7

1. Seated divinity in flounced robe. Before him the tree of life and two worshippers. Four lines of inscription. The original of hematite is owned by Mrs. Talcott Williams. (Cat. No. 311264, U.S.N.M.)
2. Seated divinity. Before him worshipper with left arm raised, right close to the body. Between them, below scorpion, the animal of Iskhara, or goddess of the Kassite pantheon of whom very little is known; above, star; behind the god are three small animals, one above the other. The original, of carnelian, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207918, U.S.N.M.)
3. The same as plate 6, No. 6.
4. Two divinities standing. In the field, tree and crescent. The engraving is too much worn for detailed identification. The original is owned by Mrs. Talcott Williams. (Cat. No. 311287, U.S.N.M.)
5. In the center, Shamash, the sun god, stepping over a mountain, symbolizing sunrise; to his right, another god, perhaps Sin, the moon god, as suggested by the crescent above; to his left, a worshipper. One line of inscription. The original of basalt from Aintab, Syria, is owned by Frederick Stearns. (Cat. No. 158437, U.S.N.M.)

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[15] The Babylonian caduceus consists of two serpents rising from a vertical stem, with imperfect bodies and heads thrown outward. The neck is thickened, like that of the Egyptian asp (sacred uraeus). This caduceus may have been the source of the Greek caduceus, carried by Hermes (Mercury), and was probably originally conceived as a weapon. Compare W. H. Ward, The Seal Cylinders of Western Asia, p. 408.

6. Shamash stepping over the mountain, as in the preceding seal. Before him a worshipper introduced by another deity, the former with low cap, the latter with conical headdress, both in long robes. In the field, crescent and three lines of inscription. The original is owned by Mrs. Talcott Williams. (Cat. No. 311274, U.S.N.M.)
7. Shamash stepping over a mountain, as in the preceding, with a worshipper brought up by another god. In the field, stars and crescent. The original is owned by Mrs. Talcott Williams. (Cat. No. 311269, U.S.N.M.)
8. God seated. A priest leads up by the hand a suppliant. The original of limestone from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207914, U.S.N.M.)
9. Two figures in low, round caps and long robes standing with raised left arms before a god in short tunic, perhaps representing Raman, the storm god. In the field, between the figures, some undetermined animals; above, crescent. Two lines of inscription. The original is not known. (Cat. No. 168976I, U.S.N.M.)

PLATE 8

1. God seated, holding staff or scepter, a small animal climbs up his knees. The first figure in long robe, right arm raised, left close to the body, is turned toward the god, perhaps introducing the worshippers. The next two figures, in flounced robes, are facing one another. The last figure is facing front. In the field, above, sun in crescent; the other objects on top are not determined. Below, between the two first figures, is what has been termed "libra," the significance of which is not exactly known (compare W. H. Ward, The Seal Cylinders of Western Asia, p. 408); between the two last figures, a small nude figure, perhaps Zirbanit, the consort of Marduk. One line of inscription. The original is not known. (Cat. No. 168976, U.S.N.M.)
2. In the center, Raman, the storm god, in short tunic, facing front, on one side his wife, Shala, in high headdress and flounced robe, with raised arms, turned toward him; on the other, nude figure, facing front, hands akimbo, probably intended for Zirbanit, the spouse of Marduk. The original is owned by Mrs. Talcott Williams. (Cat. No. 311277, U.S.N.M.)
3. God in round cap and short tunic, probably Raman, holding in his right hand the scimitar, left arm raised. Another god seizes a small figure around the waist. The rest of the engraving is too much worn for identification. Three columns of inscription. The original is owned by Mrs. Talcott Williams. (Cat. No. 311272, U.S.N.M.)
4. Raman, Shala, between them Zirbanit. Three columns of inscription. The original, of carnelian, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207901, U.S.N.M.)
5. God in long robe, right arm raised in blessing, left close to the body, perhaps Sin, as may be indicated by the crescent above. Nude female figure, probably Zirbanit, the spouse of Marduk, and the thunderbolt of Raman, the storm god, resting upon his animal, the bull. In the field, fish (for which see pl. 2, No. 4), some small animal (monkey (?)), and crook. The original is owned by Mrs. Talcott Williams. (Cat. No. 311286, U.S.N.M.)
6. Raman, the storm god, in high pointed headdress and short tunic, with left foot on the bull, his animal, holding in his left hand the thunderbolt, in his raised right a club. Next is Shamash, the sun god, stepping with his right foot over a mountain (sunrise), and two worshippers or

deities. In the field, between the two worshippers, "libra" (for which see pl. 8, No. 1), and the column (ashera) of Marduk. The original is owned by Mrs. Talcott Williams. (Cat. No. 311266, U.S.N.M.)

7. Raman, holding in his left hand the thunderbolt, with his raised right wielding a club or scimitar; a half-leaning small figure with raised right arm as if to ward off a blow; between them, some small animal (?). Next, Ishtar in long robe and high headdress, holding in her raised right hand the serpent caduceus (for which see pl. 6, No. 7), in her hanging down left hand, a club or scimitar. Behind, probably Shala, the consort of Raman. The original, of chalcedony, is owned by Mrs. Talcott Williams. (Cat. No. 311270, U.S.N.M.)
8. God, probably Shamash, the sun god, approached by two suppliants, or a suppliant presented by another god or priest. One column of inscription. The original, of hematite, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207960, U.S.N.M.)
9. Raman and Shala, separated by three columns of inscription. The original, of hematite, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207959, U.S.N.M.)
10. Raman, Shala, and Zirbanit (pl. 8, No. 4). In the field, crescent, "libra," and crook. The original, of hematite, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207919, U.S.N.M.)

Plate 9

1. Probably "Syro-Hittite" seal.[16] Two gods in round caps and short garments, one, in front, raising the right hand in blessing, in the left holding a scepter or club; the other behind, holding a lance, probably both representing Raman. Before them Shala in long flounced robe in the attitude of adoration. In the field, rope pattern (guilloche)[17] between two lion-headed sphinxes. The original is owned by Mrs. Talcott Williams. (Cat. No. 311284, U.S.N.M.)
2. Syro-Hittite seal. Naked goddess—Zirbanit—within an arch, holding what looks like a skipping rope or garland. The arch is framed with branches. God or king in conical headdress, holding scepter or club and scimitar. In the field, rope pattern between ibexes. Below, rhomb (for which see pl. 3, No. 1). The original is owned by Mrs. Talcott Williams. (Cat. No. 311271, U.S.N.M.)
3. Seated god to whom a worshipper is introduced by a priest or another god. In the field, crescent (Sin). Three columns of inscription. The original is owned by Mrs. Talcott Williams. (Cat. No. 311282, U.S.N.M)
4. Seated god and goddess holding cups. Between them a standing figure also holding a cup. Perhaps a libation scene. One column of inscription. The original is owned by Mrs. Talcott Williams. (Cat. No. 311283, U.S.N.M.)

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[16] The Hittite empire at one time or another was spread over all the region from Smyrna to Lake Van and from Nineveh to Sidon in Phenicia. The Hittites in this connection include a succession of peoples of the same general race, besides the Hittites (Khatti) proper, as the Mitani, the people of Naharina, the Lycians (Lukki), the Cilicians (Khilukki), which inhabited different sections from Armenia to the Mediterranean until they were, in the eighth century B. C., swallowed up in the Assyrian empire. Being placed between the two great empires of antiquity, their art and religion were necessarily much influenced by the civilization and religion of Egypt and Babylonia.

[17] The guilloche is specially characteristic of the Syro-Hittite art, being its most favorite ornament. It apparently originated in Egypt and may have been simply an ornament. Compare W. H. Ward, The Cylinder Seals of Western Asia, p. 411.

5. Shamash with one foot on a mountain (sunrise). Suppliant introduced by another god or priest. Behind them, a fish and a scorpion (for which see pl. 7, No. 2). Between Shamash and the worshipper, crescent and a human head. Behind Shamash, a small dancing figurine and a tree (?). The original, of hematite, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207,902, U. S. N.M.)
6. Syro-Hittite seal. Three divinities standing upon animals as their pedestals; two of them, the one of left end and the middle one, upon antelopes, the third upon a lion. In the field, two small ibexes, libra (for which see pl. 8, No. 1), and some undetermined objects. The original is owned by Mrs. Talcott Williams. (Cat. No. 311276, U.S.N.M.)
7. Turbaned bust between branches. Persian. The original, a spheroid of clouded chalcedony, from Asia Minor, is owned by Frederick Stearns. (Cat. No. 158901, U.S.N.M.)
8. In the center is an altar on which lies a fish, surmounted by the crescent (Sin), and star (Ishtar). To the left, a god in horned headgear and elaborate robe extending the left hand; to the right, worshipper or priest, arms akimbo. In the field, the caduceus (for which see pl. 6, No. 7), which rests on the rhomb or triangle, and over this are curved stems on either side of the shaft, crossed each with three bars. On top, between the serpents, is a vase or the spearhead of Marduk. The original of onyx, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207913, U.S.N.M.)

PLATE 10

1. God, holding staff or scepter, advancing. Behind him procession of four worshippers. Above the latter two birds facing one another. The original is owned by Mrs. Talcott Williams. (Cat. No. 311279, U.S.N.M.)
2. God seated, probably Sin, the moon god. Worshipper introduced by priest or god. In the field, above, crescent and ashera; in the middle, between the god and worshipper, a small dancing figure; between the two standing figures, another small nude figure, perhaps Zirbanit, the spouse of Marduk. Three columns of inscription. The original is owned by Mrs. Talcott Williams. (Cat. No. 311268, U.S.N.M.)
3. Shamash, the sun god, having emerged from the gates of heaven, held by two porters, steps over the eastern mountain, symbolizing sunrise. Between the two porters is another figure, and in the field, next to the right hand gate, is the column (ashera) of Marduk. The original of schist, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207909, U.S.N.M.)
4. Raman, the storm god, holding the bull, his animal, upside down by its hind legs with his foot on the head of the animal. Behind him a worshipper introduced by a god in horned turban. In the field, at right end, in the center the lamp of Nusku, the fire god; above and below, heads. The original, of hematite, from Baghdad, Mespotamia, is owned by Prof. H. Hyvernat. (Cat. No. 300582, U.S.N.M.)
5. Raman in the center; on either side of him probably Shala, his spouse, doubled for the sake of symmetry. In the field, above, the vase of Nusku and crescent; below, libra (pl. 8, No. 1) and an arrow-shaped object. Three lines of inscription. The original, of composition, is owned by Prof. H. Hyvernat. (Cat. No. 300583, U.S.N.M.)

6. On right end, divinity in long robe with feather bush hanging from his headdress, in front of altar. Over the altar is the column of the god Nebo. Next to it is a herme, that is, a column, surmounted by a human head, protected by a covering. Next, a lion on its hindlegs has the front feet on a column which is topped by a cone. Beneath the lion are two human heads (?). At the extreme left is a figure holding a cone, and libra. The original, of steatite, is owned by Frederick Stearns. (Cat. No. 158429, U.S.N.M.)
7. God standing on horned animal—perhaps Marduk on his horned dragon. There are three other tall figures and one small one. In the field, a reversed arrowhead, some small animal (?), and a crook or erect snake (?). The original is owned by Mrs. Talcott Williams. (Cat. No. 311273, U.S.N.M.)
8. Kassite seal.[18] Worshipper or god and five columns of inscription. In the field, fallow deer (?), rhomb, and "Greek cross," formed of two cross lines in a frame or in an enveloping cross. Dr. W. H. Ward, Seal Cylinders, etc., p. 394, remarks that this included cross also appears in Crete, and surmises that out of this cross was the swastika derived. The original, of agate, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207933, U.S.N.M.)
9. Raman and two goddesses. The latter, who probably represent Shala, the spouse of Raman, doubled, hold between them a staff or scepter, surmounted by a star. Drill work. The original is owned by Mrs. Talcott Williams. (Cat. No. 311275, U.S.N.M.)

PLATE 11

1. Marduk, with scepter, standing on his animal, the horned dragon. Behind him a composite figure, half man and half animal, probably intended for Enkidu (pl. 1, No. 3), in the attitude of adoration. The third figure, also holding a scepter, may be a king. In the field, above, star (Ishtar), the winged disk of Ashur, and seven dotes (pl. 3, No. 1); between the figures, the spearheaded column of Marduk, and the column in form of a stylus of Nebo (Nabu), the god of writing. The original, of chalcedony, is owned by Miss M. W. Bruce. (Cat. No. 130272, U.S.N.M.)
2. God seated holding cup. In front, three worshippers; behind, an attendant. Probably libation scene. In the field, the spearheaded column of Marduk and another ashera, probably of Nebo. The original of slate, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207925, U.S.N.M.)
3. Syro-Hittite seal. Raman and Zirbanit. Behind them, an ibex or gazelle crouching attacked by a winged sphinx between guilloches or rope patterns, the characteristic ornament of the Syro-Hittite seals. In the field,

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[18] The origin of the Kassites is still involved in doubt. They were a people of mountaineers, north of Babylonia, who, in about 1760, succeeded in conquering Babylonia and maintaining themselves for more than half a millennium. They were a semibarbarous people, but capable of rapidly assimilating the elements of the higher civilization of Babylonia, with which they came in contact. Their cylinder seals are usually long in proportion to their diameter, and notable for their long inscriptions, which may run to seven or eight lines, which are usually composed of prayers to the gods. The space for figures is thus limited, often only a single figure appearing, or two at the most, a god and a worshiper. Of the emblems occurring on Kassite seals the most remarkable is the "Greek cross." Compare Morris Jastrow, The Civilization of Babylonia and Assyria, 1915, pp. 153, 155; W. H. Ward, Seal Cylinders of Western Asia, p. 184.

the sun in crescent and the column of Marduk. The original of hematite, from Baghdad, Mesopotamia, is owned by Prof. H. Hyvernat. (Cat. No. 300580, U.S.N.M.)

4. Ishtar standing in a circle of stars, conventionalized into dots. Before her a worshipper in long robe; behind her, a winged genius. In the field, above, crescent (Sin); below, rhomb (pl. 3, No. 1). The original, of opalescent chalcedony, from Baghdad, Mesopotamia, is owned by Prof. H. Hyvernat. (Cat. No. 300585, U.S.N.M.)
5. God stepping over mountain (Shamash and sunrise). Before him two worshippers, one in long garment, the other in short one, in the attitude of adoration. Behind is an attendant. Between the latter and the suppliants are two pairs of small figures in antipodal position. The original is owned by Mrs. Talcott Williams. (Cat. 311280, U.S.N.M.)
6. Syro-Hittite seal. Two gods or god and worshipper with uplifted arms facing one another, with an altar between them. Behind them is another god in conical headdress. In the field, heraldic vulture, or eagle,[19] above and a sphinx below, with the guilloche between them. The original is owned by Mrs. Talcott Williams. (Cat. No. 311285, U.S.N.M.)

PLATE 12

1. Two kneeling figures adoring the tree of life, which is surmounted by the winged disk, the emblem of Ashur. In the field, star (Ishtar) and eagle (pl. 11, No. 6). The original, of chalcedony, from Baghdad, Mesopotamia, is owned by Prof. H. Hyvernat. (Cat. No. 300599, U.S.N.M.)
2. Raman and Shala. In the field, the thunderbolt of Raman. The other objects are indefinable. The original, of hematite, from Baghdad, Mesopotamia, is owned by Prof. H. Hyvernat. (Cat. No. 300584, U.S.N.M.)
3. Three standing figures in long garments. Between them asheras (?), one of which is surmounted by the crescent. The original is unknown. (Cat. No. 168976F, U.S.N.M.)
4. Engraved in two registers. In the upper one, two worshippers before the tree of life, which is stylized into the form of a cypress; in the lower, geese or swans. The original, of hematite, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207938, U.S.N.M.)
5. Seated god with worshipper and priest approaching. In the field, above, two dots and crescent; below, fish and ibex (?). The original, of hematite, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207929, U.S.N.M.)
6. Animals crossing each other and fighting. Two serpents intertwined. The serpent (Babylonian, siru) is the emblem of Ninlil, the spouse of Enlil, the chief god of Nippur. The original, of limestone, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207930, U.S.N.M.)
7. God seated, holding vase (?), perhaps Shamash, the sun god. A worshipper is introduced by a god in horned turban (?) and flounced robe. In the field, crescent. Three columns of inscription. The original, of hematite, is owned by Mrs. Talcott Williams. (Cat. No. 311259, U.S.N.M.)

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[19] The figure of the eagle played a great part in art and early religious symbolism. It was the symbolic animal and the coat of arms of Lagash (modern Tello) and other Babylonian cities.

PLATE 13

1. Raman, the storm god, in short tunic, holding in the right hand a cone, the left arm close to the body, with his spouse, Shala, in conical headdress and long flounced robe, doubled for the sake of symmetry. In the field, above, some insect (?); in the middle, on one side, a fallow deer, on the other, some small horned animal; below, a bird on a mountain. Two columns of inscription. The original, of jasper, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207912, U.S.N.M.)
2. Raman and Shala. Between them a cypress. Three columns of inscription. The original, of lapis-lazuli, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207904, U.S.N.M.)
3. Raman and Shala, separated by two columns of inscription. In the field, star (Ishtar). The original, of hematite, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207958, U.S.N.M.)
4. In the center, Raman and Shala. Between them, three dots, the number of Sin, the moon god. Behind Raman is an attendant and next to the latter the small nude figure of Zirbanit, the consort of Marduk. Behind Shala a worshipper holding kid for sacrifice, facing another god. Between them, one dot. The figures are framed between borders of double zigzag triangular lines, with dots in them. The original, barrel shaped of lapis-lazuli, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207941, U.S.N.M.)
5. Two divinities, one in short tunic, the other in long flounced probe, opening the gate (for the sun god to pass (?)). Below the gate is a small nude figure dancing. A column, surmounted by the sun in crescent, separates them from another nude figure, holding a scepter or club, which may represent Shamash, the sun god. The original is owned by Mrs. Talcott Williams. (Cat. No. 311267, U.S.N.M.)
6. Raman and Shala. Two columns of inscription. The original is owned by Mrs. Talcott Williams. (Cat. No. 311278, U.S.N.M.)

PLATE 14

1. Battle with gazelles. The scene is doubled for the sake of symmetry. In the field, a star (Ishtar) and some undefinable objects. The original is owned by Mrs. Talcott Williams. (Cat. No. 311265, U.S.N.M.)
2. Seated figure holding a cup in front of intertwined serpents. Offering a libation to a serpent god (?). The original, pyramidal of limestone, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207949, U.S.N.M.)
3. Two rams couchant facing one another. The original, a spheroid of agate, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207950, U.S.N.M.)
4. Contest with fantastic monstrous animals. The original, of quartzite, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207903, U.S.N.M.)
5. Kassite seal. Worshipper in low cap and long garment. In the field, above, the Kassite cross; in the middle, the sun in form of rosette, and a small animal. Seven columns of inscription. (See on Kassite seals, pl. 10, No. 8.) The original, of limestone, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207927, U.S.N.M.)

6. A god or man, nude except for a belt, seizing with one hand the head of a gazelle, which stands on its hindlegs and has turned its head backward, with the other the tail of a scorpion. Between the two animals is a horned serpent, and underneath the scorpion a knot ornament. The original, of limestone, is owned by Mrs. Talcott Williams. (Cat. No. 311261, U.S.N.M.)

PLATE 15

1. Marduk fighting Tiamat, the personification of chaos and cosmic disorder, who is represented as a composite monster with human head, eagle's wings, and body of a lion. The scene is doubled for the sake of symmetry (pl. 3). The object at the bottom of the seal is not determined. The original, of limestone, is owned by Mrs. Talcott Williams. (Cat. No. 311260, U.S.N.M.)
2. Contest with animals (gazelles ?). In the field, the winged disk of Ashur and the spearheaded ashera of Marduk reversed. The original, of schist, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207925, U.S.N.M.)
3. God or man between two gazelles, seizing one by the head, the other by the tail. The original, of calcite, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207917, U.S.N.M.)
4. Contest with gazelles(?). The original, of white quartzite, is owned by Frederick Stearns. (Cat. No. 158436, U.S.N.M.)

PLATE 16

1. Two naked figures in fight with monsters. A third figure has his right foot on the head of the animal which the other holds by its hind legs upside down. In the field, a fish, crescent, a pointed club with projections in the center, and an indefinable object. The original is owned by Miss M. W. Bruce. (Cat. No. 130274, U.S.N.M.)
2. Three horned animals—fallow deer (?)—disporting themselves in a field, seven dots (pl. 3, No. 1), tree, and an indefinable object. The original, of porcelain, from Baghdad, Mesopotamia, is owned by Prof. H. Hyvernat. (Cat. No. 300594, U.S.N.M.)
3. Hunting scene: Man with bow aiming at a fleeing deer. In the field, crescent (Sin, the moon god) and rayed sun disk (Shamash), or star (Ishtar). The original, of schist, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207946, U.S.N.M.)
4. In the center Enkidu (pl. 1) fighting a lion, whose forelegs he has grasped. To the right a lion has in its mouth the snake-like head of some animal, and is in turn attacked by a winged monster. The original is owned by Mrs. Talcott Williams. (Cat. No. 311281, U.S.N.M.)
5. Agricultural seal. Seated deity holding a stalk of wheat. Before him a man driving an animal with a curved stick. On the side of the animal are two grain stalks fastened to poles. In the field, crescent; two columns of inscription. The original, of mixed diorite, from Baghdad, Mesopotamia, is owned by H. Hyvernat. (Cat. No. 300592, U.S.N.M.)

PLATE 17

1. Engraved in two registers which are separated by a geometric band of squares and dots. In the upper register are depicted two worship scenes. to the left a god in elaborate dress seated on an ornamented chair, his right hand raised in blessing. Before him a worshipper holding a kid or

gazelle for sacrifice, attended by a priest or another god. To the right is another seated god with two worshippers before him, and next to the seated figure is Raman in his usual low cap and short tunic, with thunderbolt (?) in his right hand, and facing him, perhaps Marduk with his right foot on his animal, the horned dragon. In the field, above, crescent (Sin), star (Ishtar); in the middle, asheras. In the lower register, Gilgamesh and Enkidu fighting the bull and lion, respectively, in various positions; in one of these Gilgamesh kneeling holds the animals in reversed position, head down. Behind this scene is a figure in long garment standing, serving as separator between the scenes. The original, of brownish hematite, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207934, U.S.N.M.)

2. Engraved in two registers, which are separated by a line. Perhaps Syro-Hittite or Persian seal. The upper register may represent a religious procession. In the center, a figure standing driving a chariot. Left of this scene are two nude figures led by god in long dress to the tree of life in form of a cypress. To the right of the chariot is a god, nude, walking behind four small nude figures who carry a god in long dress and conical head dress, holding the thunderbolt—perhaps the Hittite god Teshub-Adad. The mutilated lower register may depict a hunting scene. The original is owned by Mrs. Talcott Williams. (Cat. No. 311258, U.S.N.M.)
3. Persian seal, depicting a military scene. Persian soldier, bearded, with Persian garment and feathered crown, and bow and quiver on his shoulder, grasps a kneeling and appealing captive, who is clad in an elaborate garment and wearing a high helmet, with his left hand, and strikes him with the spear in his right hand. Behind the soldier and in front of a palm tree are four prisoners, their hands tied behind and their necks held by a rope. The original, of bloodstone, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207908, U.S.N.M.)

PLATE 18

1. Geometrical design, consisting of symmetrical curves and lines deeply cut. The original, deeply concave, of salmon-colored marble, is in the Metropolitan Museum of Art, New York. (Cat. No. 130283, U.S.N.M.)
2. Geometrical design, consisting of irregular curved and cruciform lines. The original, of oriental alabaster, from Baghdad, Mesopotamia, is owned by Prof. H. Hyvernat. (Cat. No. 300587, U.S.N.M.)
3. Two horned animals standing back to back, with crescentic decorations. Perhaps Cyprian seal. The original, of chert, is owned by O. C. Marsh. (Cat. No. 130249, U.S.N.M.)
4. Decorative seal: crescents and lines forming triangles and pits. The original, a scaraboid of chalcedony, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207947, U.S.N.M.)
5. Two winged dragons attacking a bull. Between the monsters is the stylized tree of life. The original, of clouded alabaster, is in the Metropolitan Museum of Art, New York. (Cat. No. 130288, U.S.N.M.)
6. Syro-Hittite seal. Ishtar, the goddess of love and fecundity, in single loose garment, which, with her left hand, she draws back, exposing navel and right leg, while in her right hand she holds her bird, the dove with wings extended. Facing her is a god in low cap and short garment. The other half of the seal is taken up with two lions couchants facing one another, and a griffin attacking an ibex, the guilloche, or rope pattern,

separating the two pairs of animals. The original, of black obsidian, is in the Metropolitan Museum of Art, New York. (Cat. No. 130279, U.S.N.M.)

7. Deer couchant. The original, a spheroid of hematite, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207948, U.S.N.M.)
8. Caparisoned horse. Persian. The original, a ringstone of agate from Asia Minor, is owned by Frederick Stearns. (Cat. No. 158378, U.S.N.M.)
9. Zebu. Inscription. The original, a spheroid of jasper, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207954, U.S.N.M.)

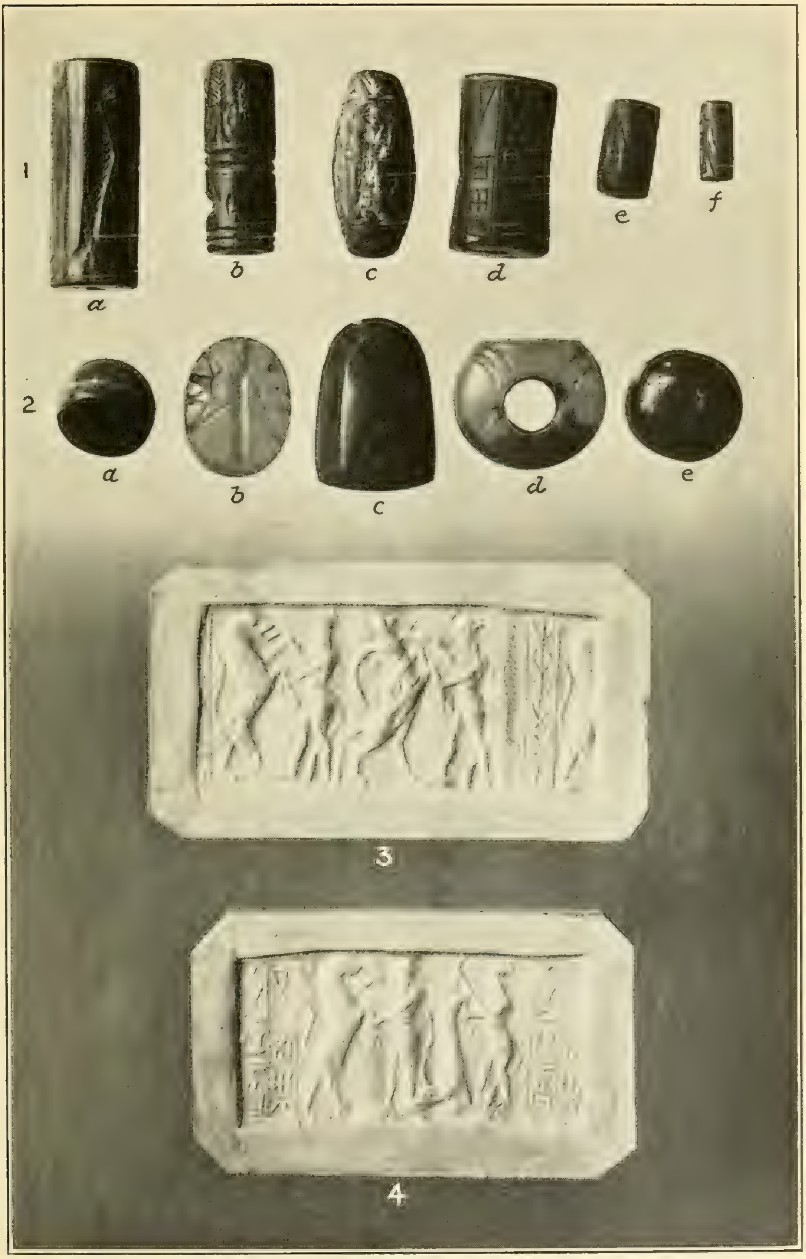
PLATE 19

1. God within an arched gate. The original, pyramidal of clouded chalcedony, from the vicinity of Antioch, Syria, is owned by Frederick Stearns. (Cat. No. 158412, U.S.N.M.)
2. Worshipper before sacred columns or asheras. Above, star (Ishtar). The original, a scaraboid of chalcedony, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207943, U.S.N.M.)
3. Worshipper in low round cap and long garment with hair looped in back, between branches. The original, of pottery, from the vicinity of Antioch, Syria, is owned by Frederick Stearns. (Cat. No. 158424, U.S.N.M.)
4. Four horned serpents intertwined. In the field, star and inscription. The original, a spheroid of jasper, from Asia Minor, is owned by Frederick Stearns. (Cat. No. 158415, U.S.N.M.)
5. Scorpion, emblem of the goddess Iskhara (pl. 7, No. 2). The original, a spheroid of chalcedony, from Cappadocia, Asia Minor, is owned by Frederick Stearns. (Cat. No. 158420, U.S.N.M.)
6. Four masks of a lion (?) arranged to form a cross. The original, a spheroid, is owned by Mrs. Talcott Williams. (Cat. No. 311288, U.S.N.M.)
7. Heron (?) with open wings. The original, a spheroid of sard, from Cappadocia, Asia Minor, is owned by Frederick Stearns. (Cat. No. 158418, U.S.N.M.)
8. Winged griffin (?). In the field, star. The original, a spheriod of serpentine, from the valley of the Tigris, Mesopotamia, is owned by Frederick Stearns. (Cat. No. 158423, U.S.N.M.)
9. Engraved in two registers. Above, *Nefr*, the Egyptian sign for good fortune, between two sacred asps (uraei), the Egyptian emblem of sovereignty and majesty; below, sphinx or some mythical animal. Between the two registers is the Egyptian winged sundisk. The original, a ringstone of chalcedony, from Asia Minor, is owned by Frederick Stearns. (Cat. No. 158361, U.S.N.M.)
10. Rude Syro-Hittite seal. Bull, with branch above. The original of steatite from the vicinity of Canchemish, Syria, is owned by Frederick Stearns. (Cat. No. 158398, U.S.N.M.)
11. Deeply notched. The three columns are crudely engraved each with a seated figure with uplifted hands. The original, of hematite, from Hillah, Mesopotamia, is in the United States National Museum. (Cat. No. 207951, U.S.N.M.)

PLATE 20

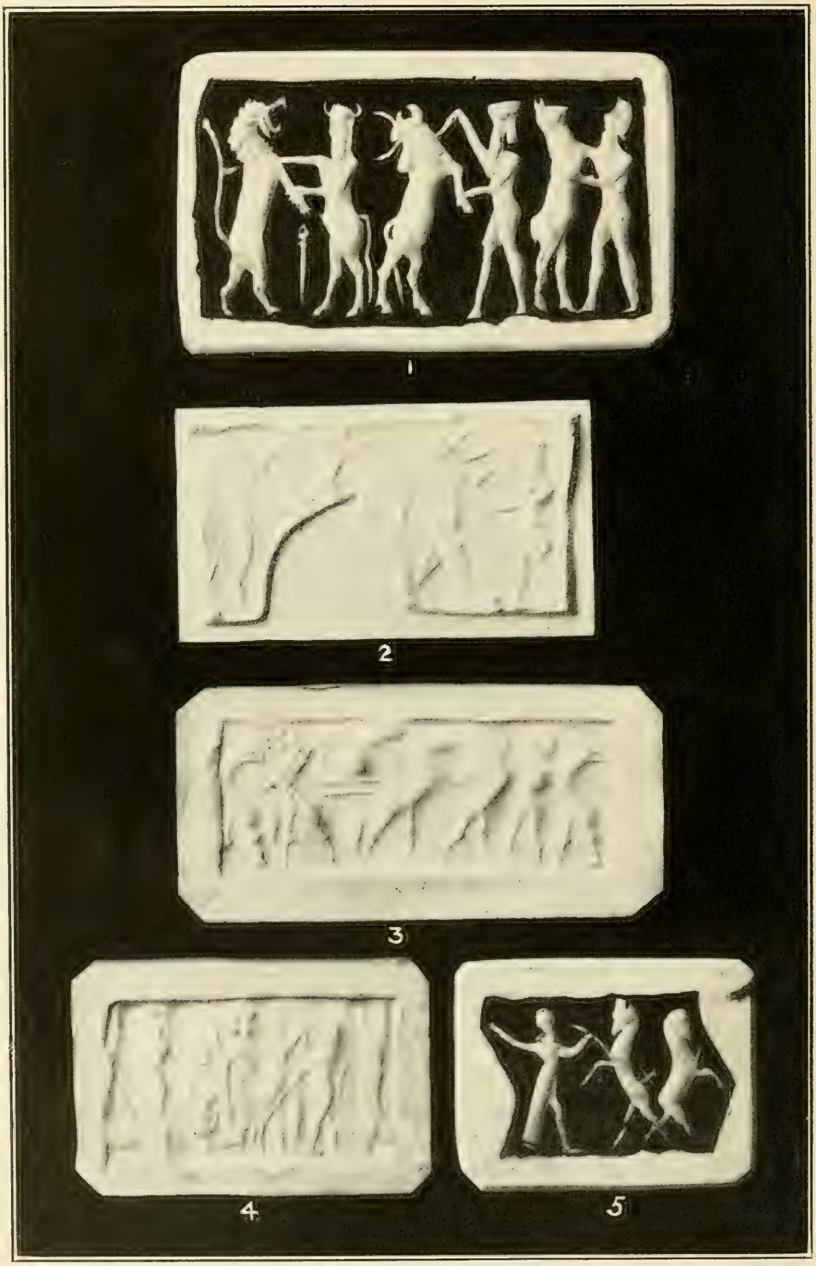
1. Zebu. Over the body, crescent; between the horns, the sundisk. The original, a ringstone of hematite, is owned by Frederick Stearns. (Cat. No. 158410, U.S.N.M.)

2. Lion rampant. The original, a ringstone of clouded chalcedony, is owned by Frederick Stearns. (Cat. No. 158400, U.S.N.M.)
3. Man on horseback. In the field, star. Probably Persian. The original, a spheroid of chalcedony from the vicinity of Aintab, Syria, is owned by Frederick Stearns. (Cat. No. 158375, U.S.N.M.)
4. Figure with helmet in short tunic standing with hands raised in adoration. The original, a ringstone of carnelian, from Asia Minor, is owned by Frederick Stearns. (Cat. No. 158380, U.S.N.M.)
5. Deity in low turban, seated, holding in the left hand a cup. In front, a palm branch; above, behind the head, a crescent. The original, a ringstone of carnelian, from Asia Minor, is owned by Frederick Stearns. (Cat. No. 158379, U.S.N.M.)
6. Two warriors (?). The original, of steatite, from Asia Minor, is owned by Frederick Stearns. (Cat. No. 158394, U.S.N.M.)
7. Rectangular double seal. On one side, sphinx (?) with star (?) above; on the other, geometrical design. The original, of steatite, from the vicinity of Aintab, Syria, is owned by Frederick Stearns. (Cat. No. 158363, U.S.N.M.)
8. Spherical double seal. On one side, goat; on the other, winged animal. The original, of seatite, from the vicinity of Aintab, Syria, is owned by Frederick Stearns. (Cat. No. 158426, U.S.N.M.)



ANCIENT ORIENTAL SEALS

FOR EXPLANATION OF PLATE SEE PAGE 9



ANCIENT ORIENTAL SEALS

FOR EXPLANATION OF PLATE SEE PAGES 9 AND 10

ANCIENT ORIENTAL SEALS

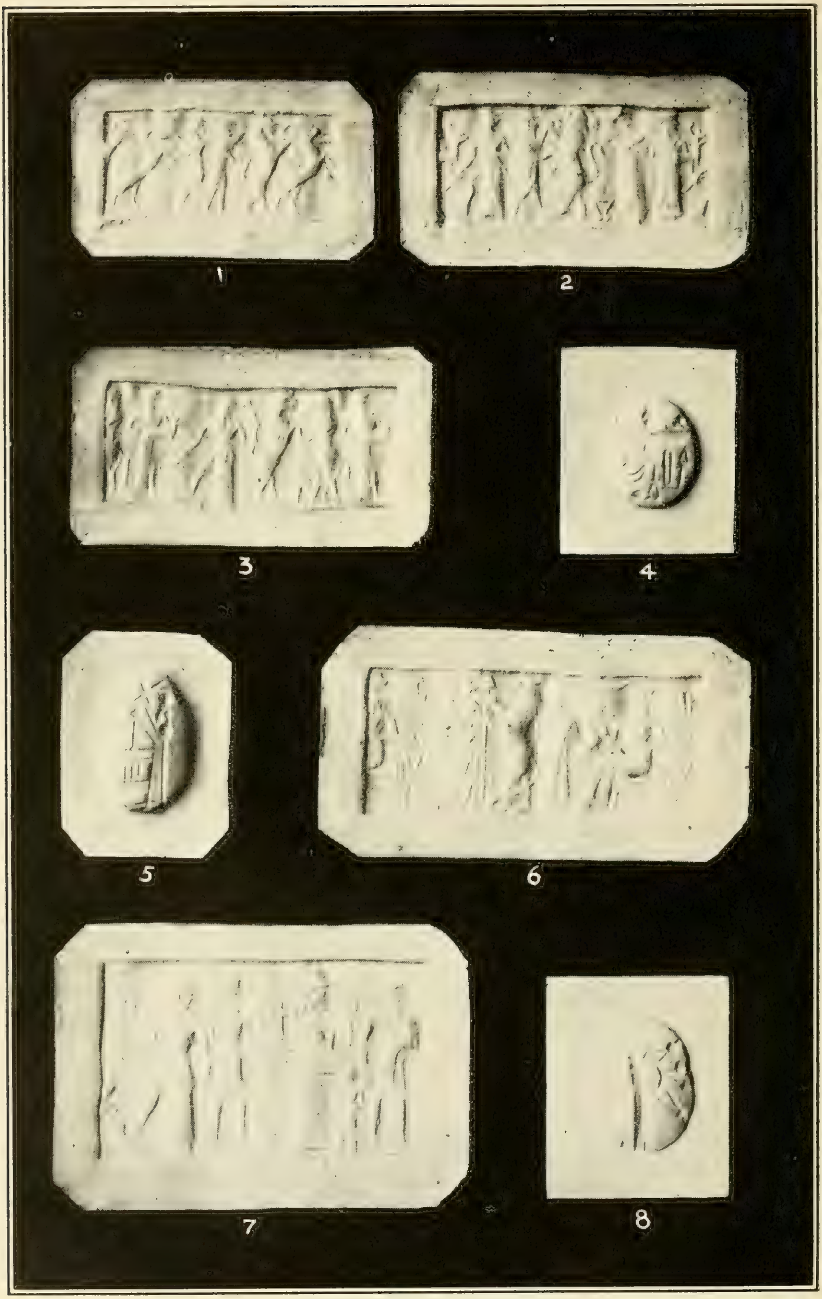
FOR EXPLANATION OF PLATE SEE PAGES 10 AND 11

ANCIENT ORIENTAL SEALS

FOR EXPLANATION OF PLATE SEE PAGE 11

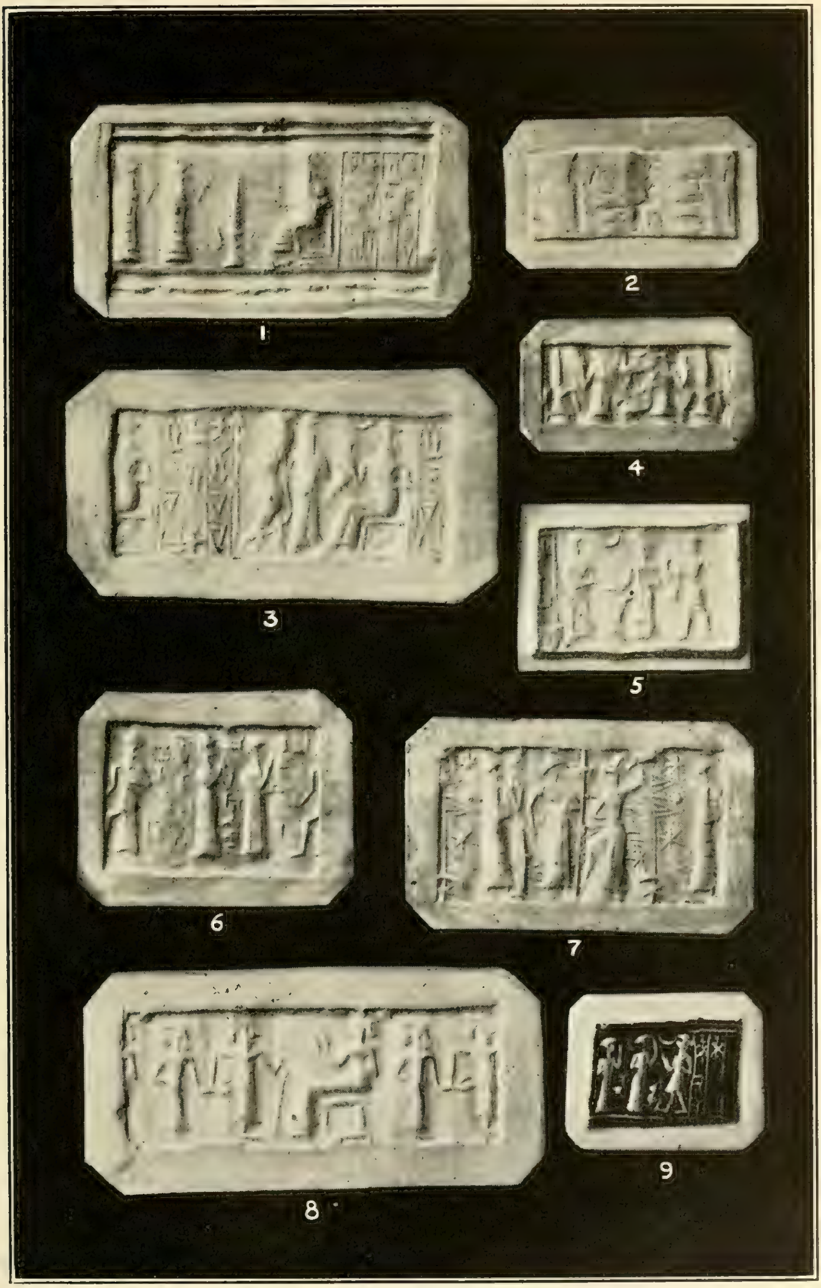
ANCIENT ORIENTAL SEALS

FOR EXPLANATION OF PLATE SEE PAGES 11 AND 12



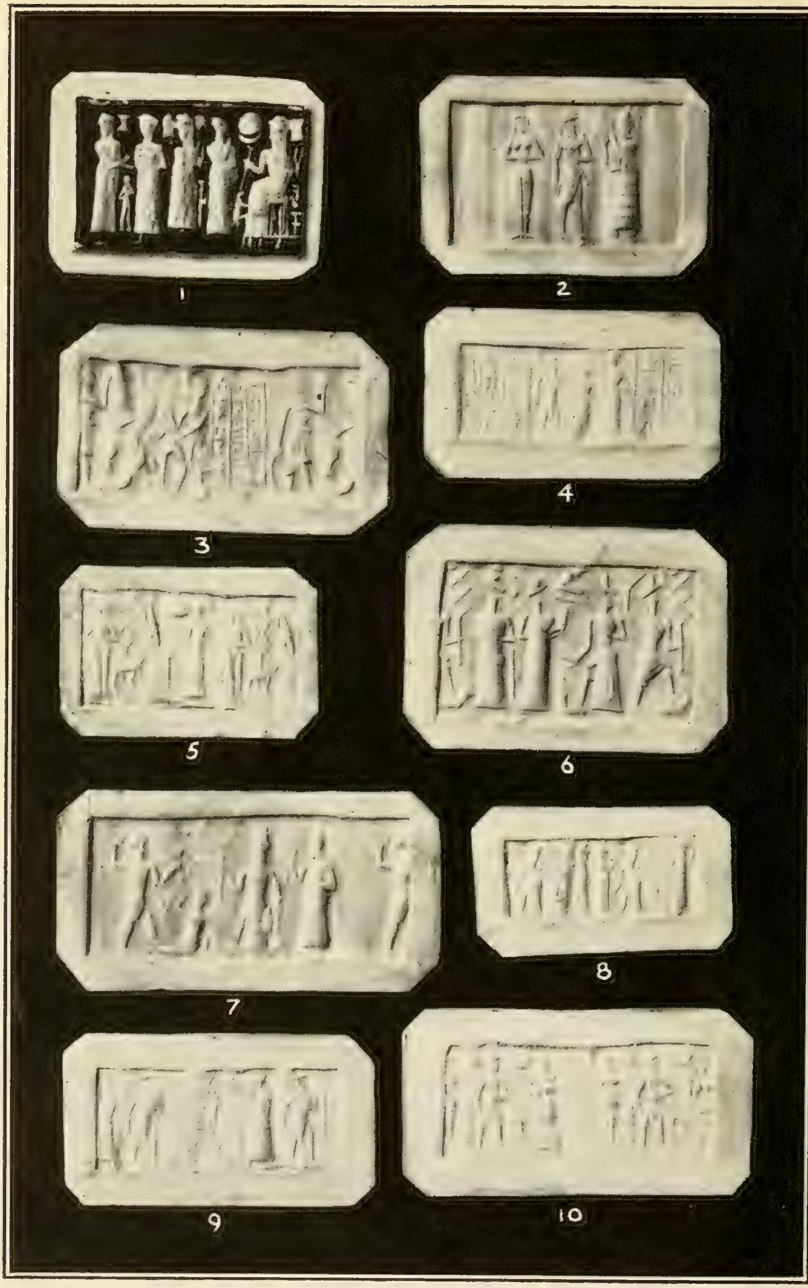
ANCIENT ORIENTAL SEALS

FOR EXPLANATION OF PLATE SEE PAGES 12 AND 13



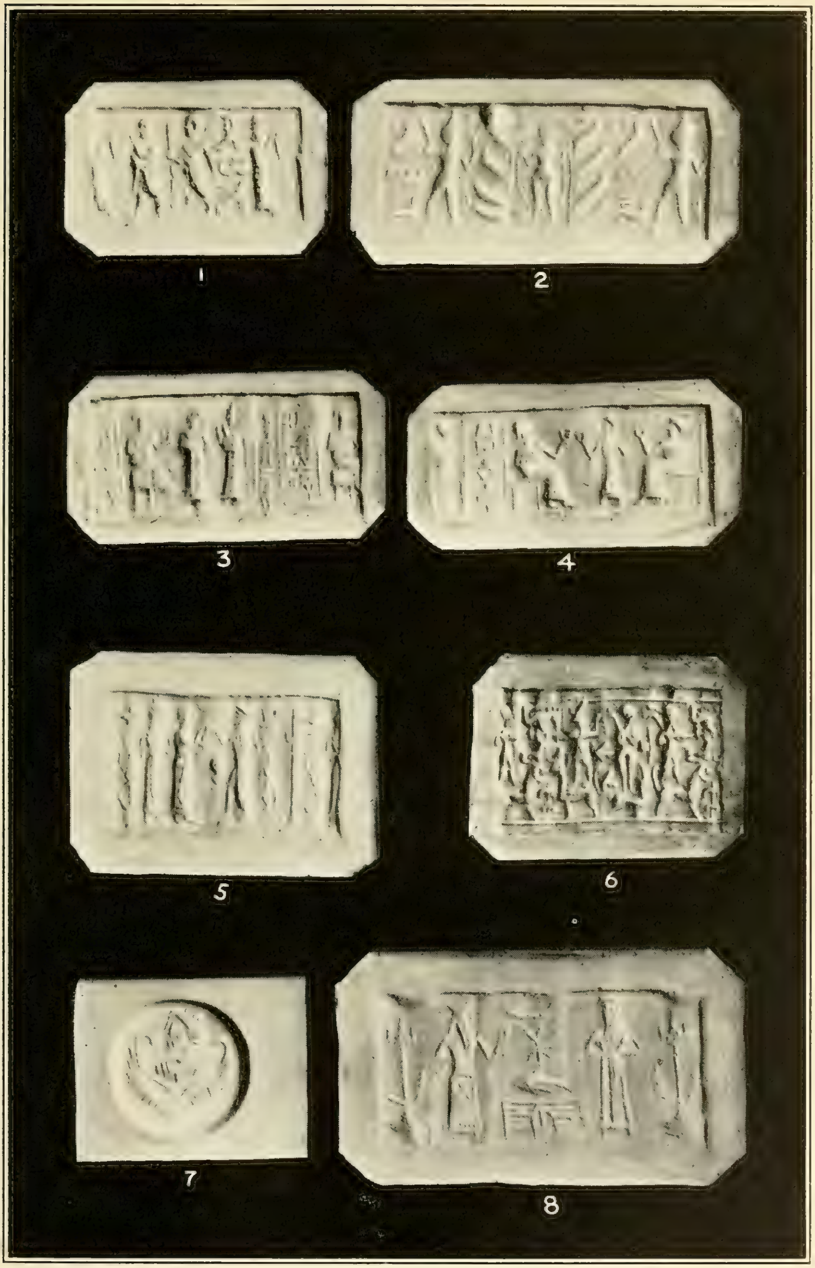
ANCIENT ORIENTAL SEALS

FOR EXPLANATION OF PLATE SEE PAGES 13 AND 14



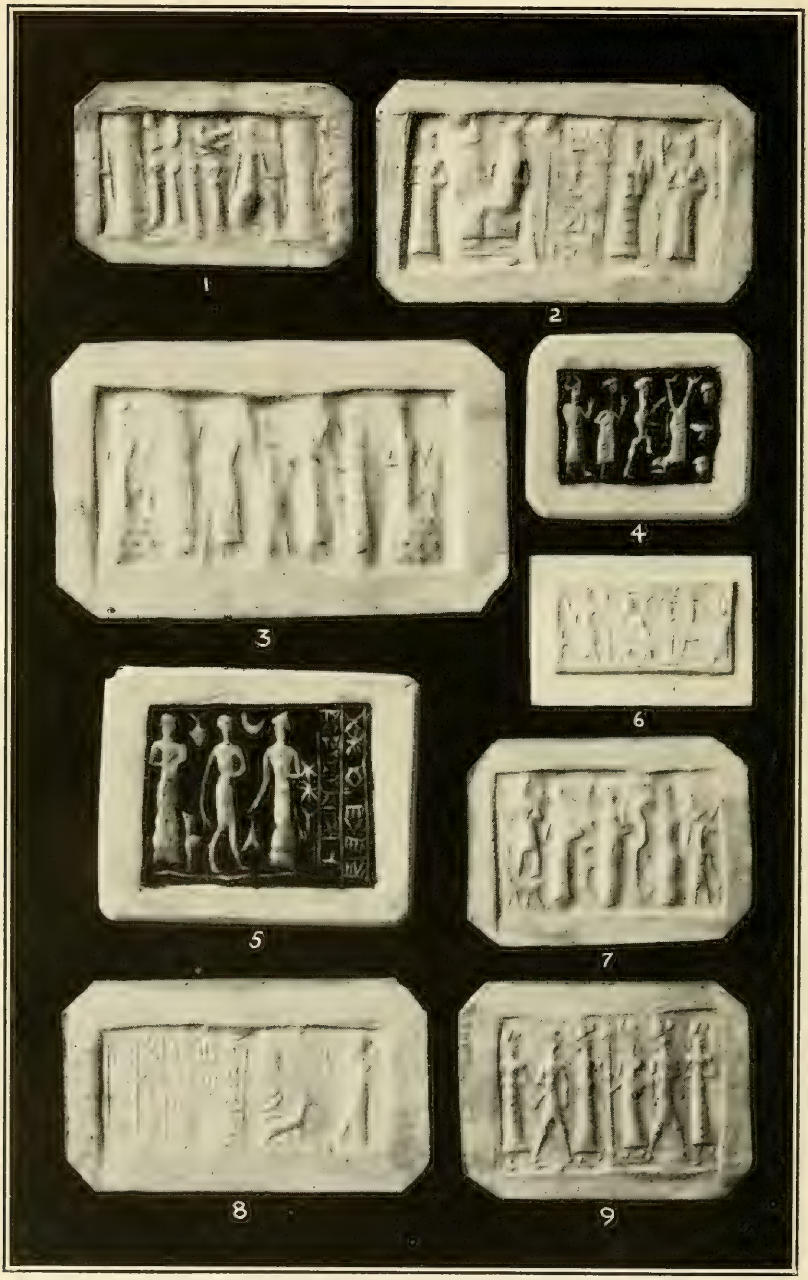
ANCIENT ORIENTAL SEALS

FOR EXPLANATION OF PLATE SEE PAGES 14 AND 15



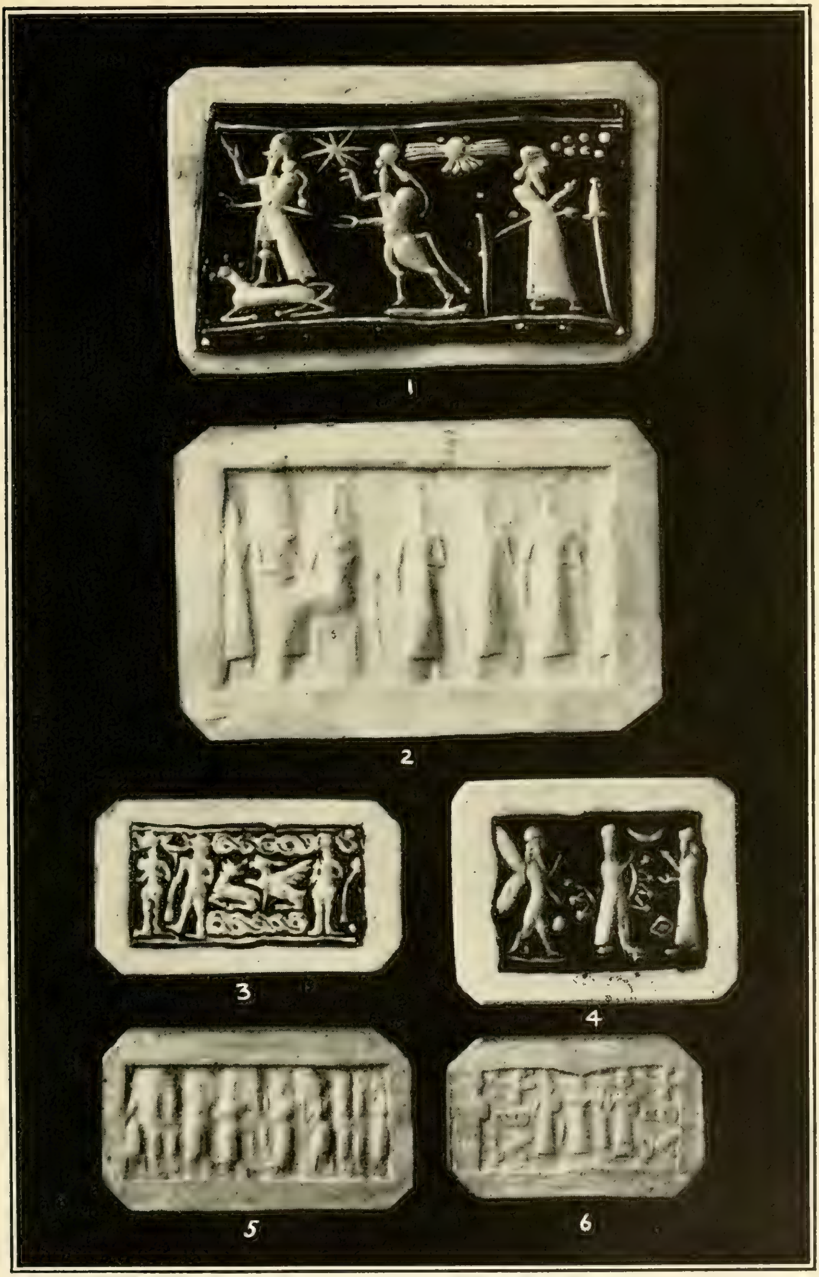
ANCIENT ORIENTAL SEALS

FOR EXPLANATION OF PLATE SEE PAGES 15 AND 16



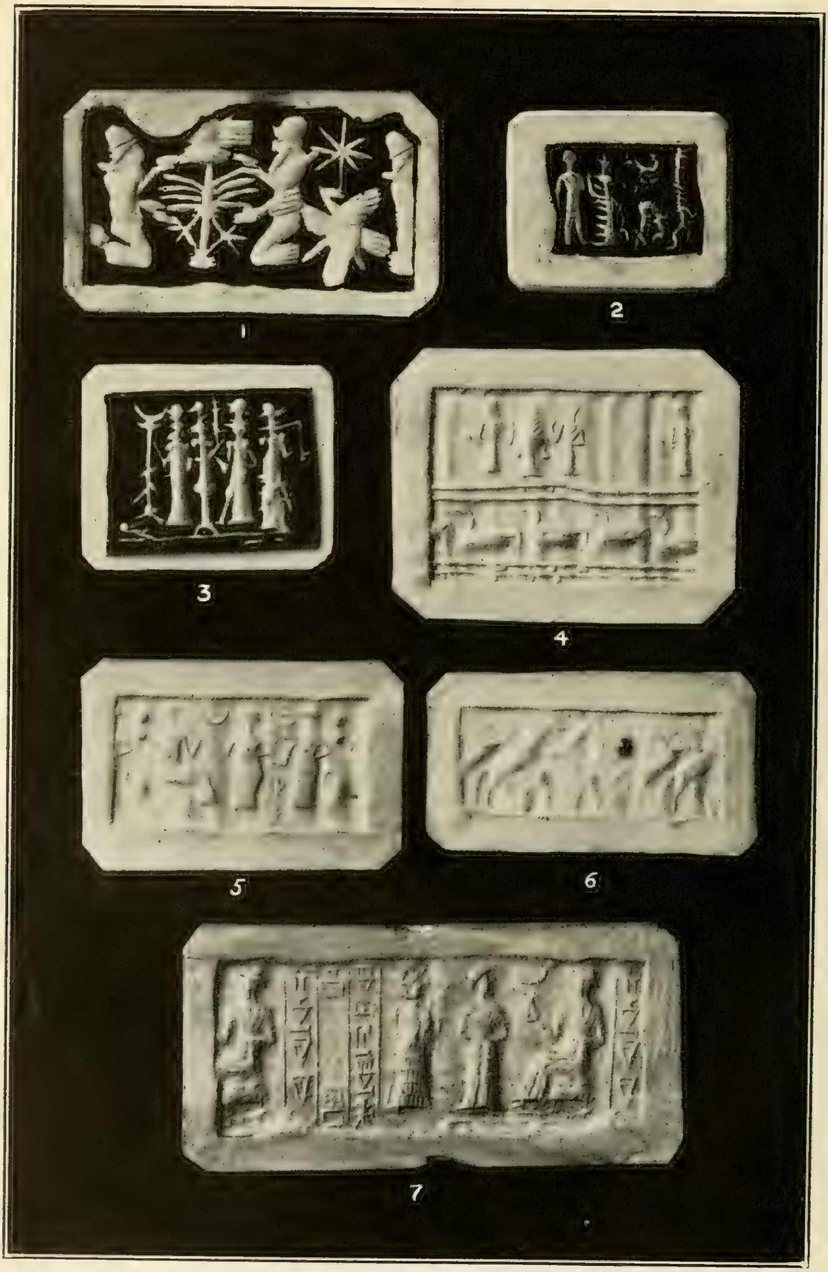
ANCIENT ORIENTAL SEALS

FOR EXPLANATION OF PLATE SEE PAGES 16 AND 17



ANCIENT ORIENTAL SEALS

FOR EXPLANATION OF PLATE SEE PAGES 17 AND 18

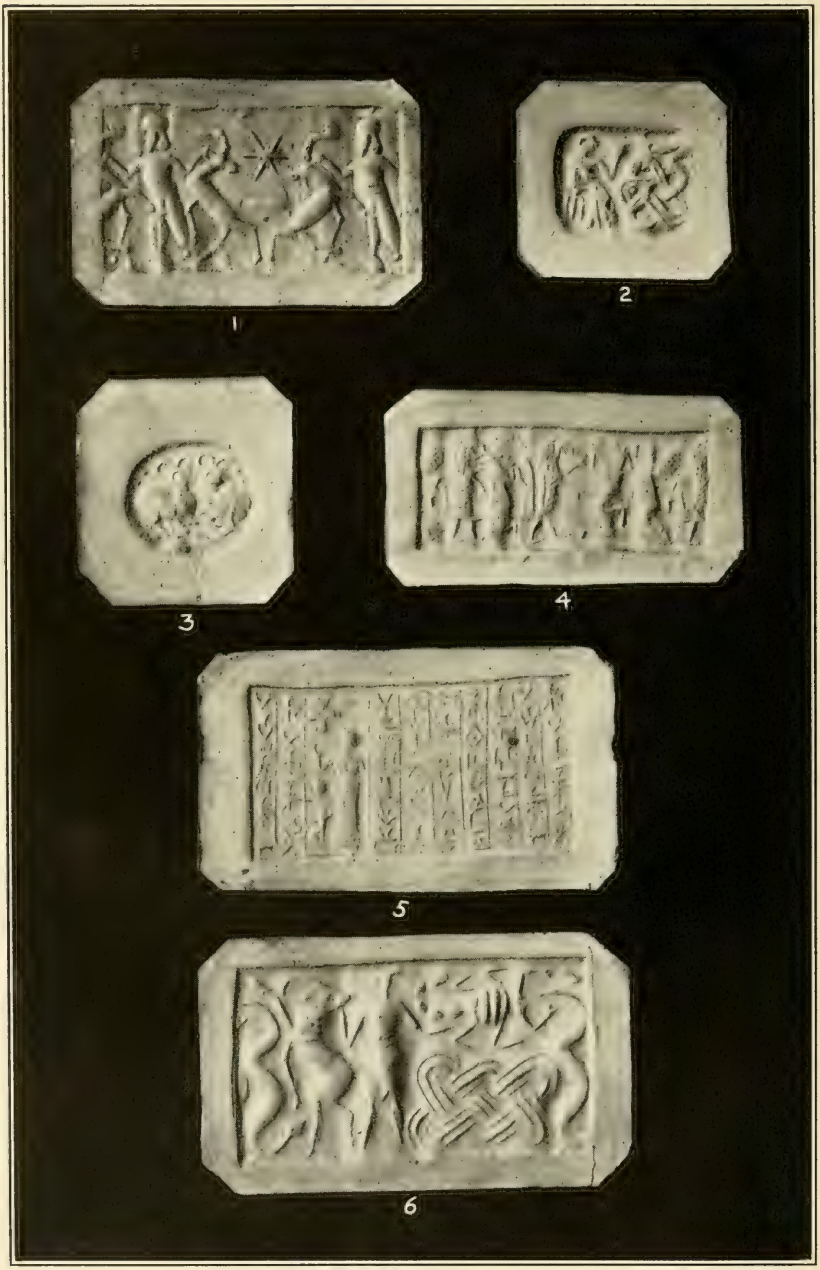


ANCIENT ORIENTAL SEALS

FOR EXPLANATION OF PLATE SEE PAGE 18

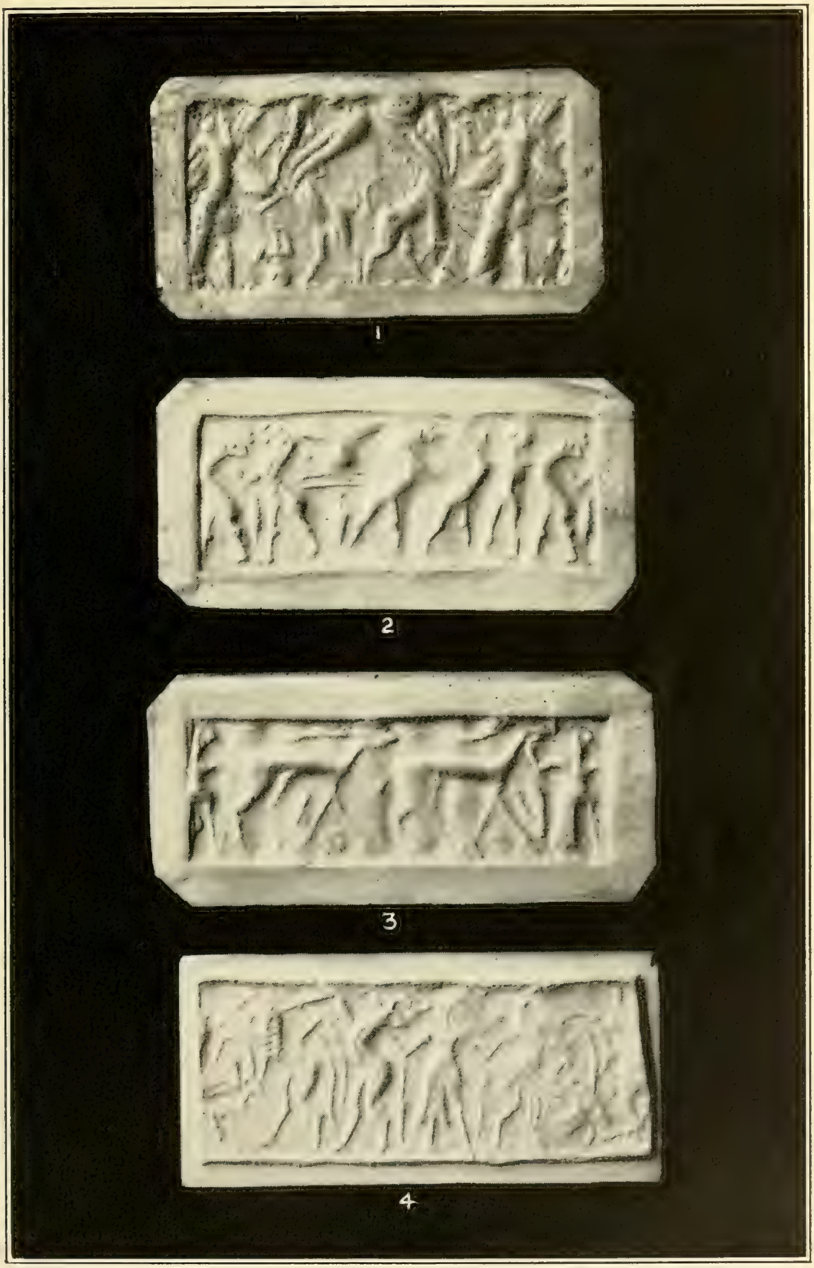
ANCIENT ORIENTAL SEALS

FOR EXPLANATION OF PLATE SEE PAGE 19



Ancient Oriental Seals

For explanation of plate see pages 19 and 20



ANCIENT ORIENTAL SEALS

FOR EXPLANATION OF PLATE SEE PAGE 20

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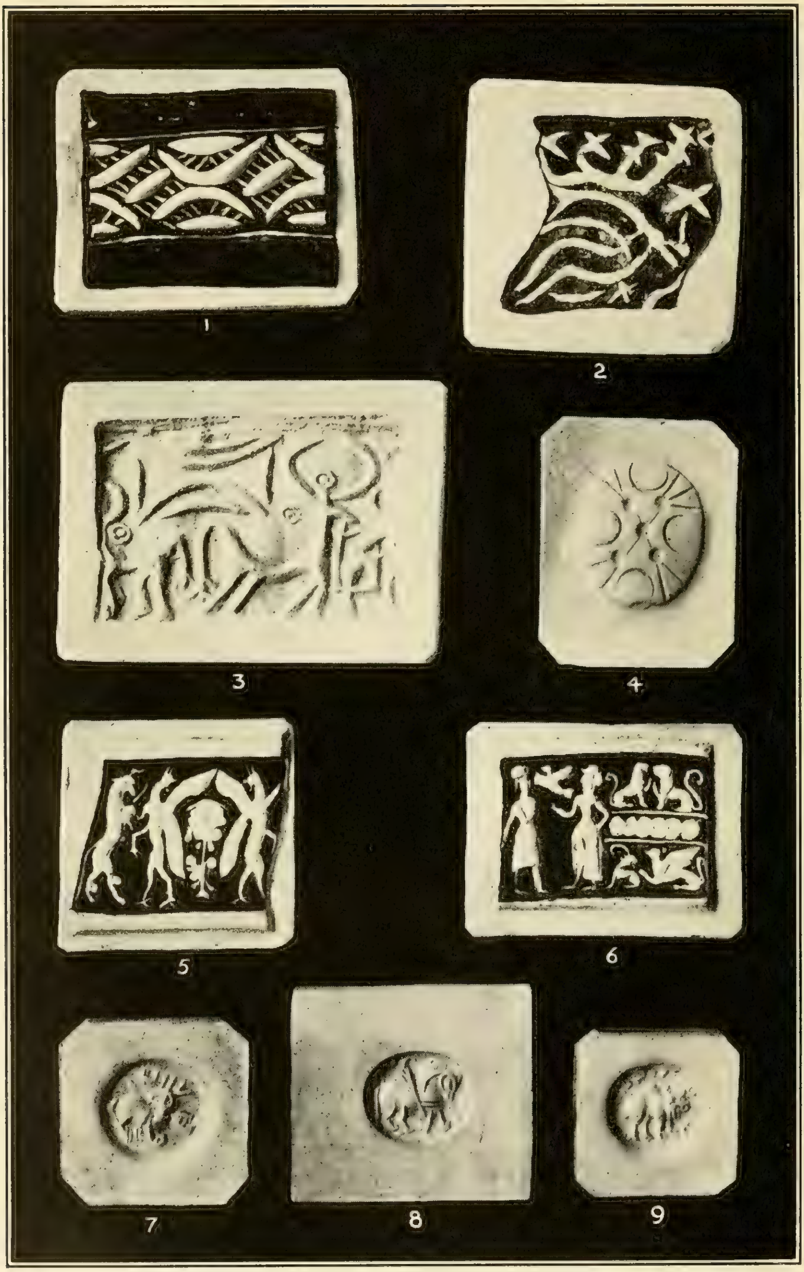
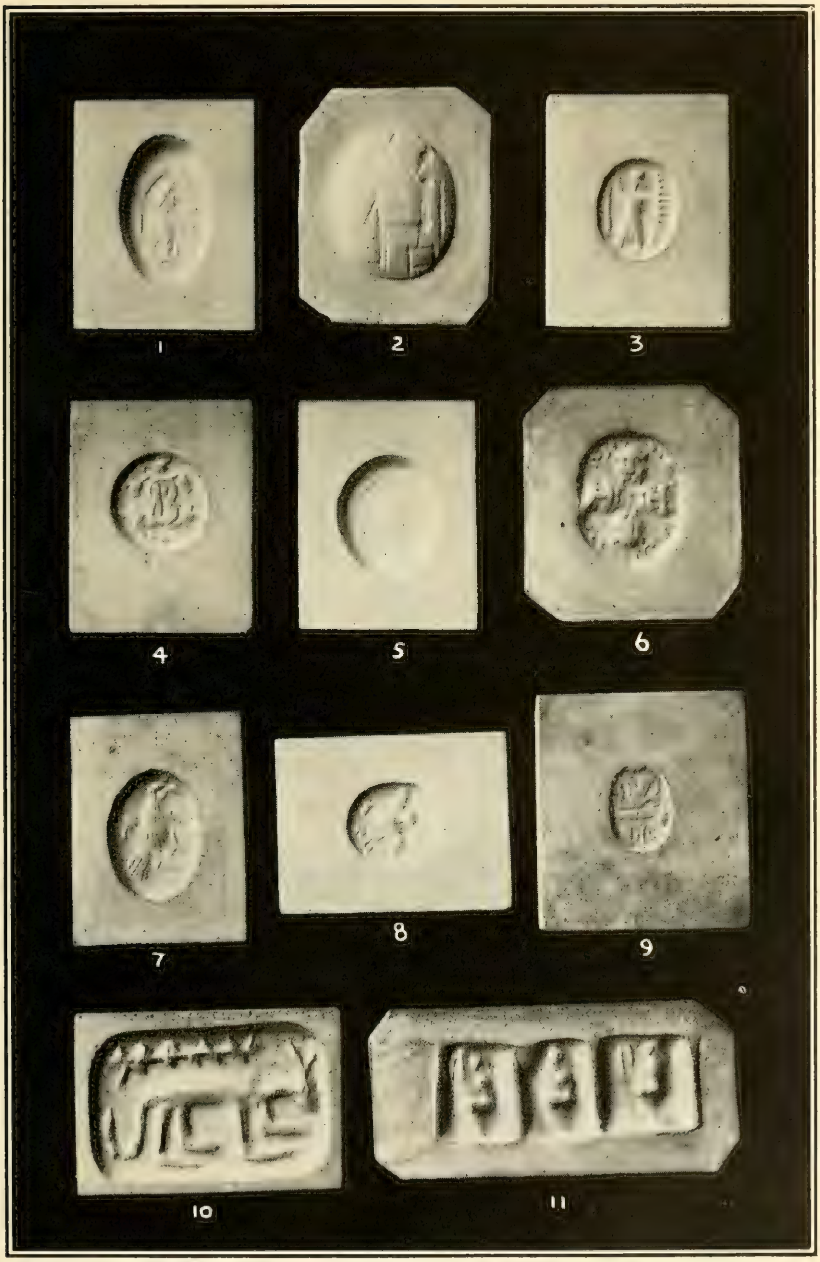
ANCIENT ORIENTAL SEALS

FOR EXPLANATION OF PLATE SEE PAGES 20 AND 21



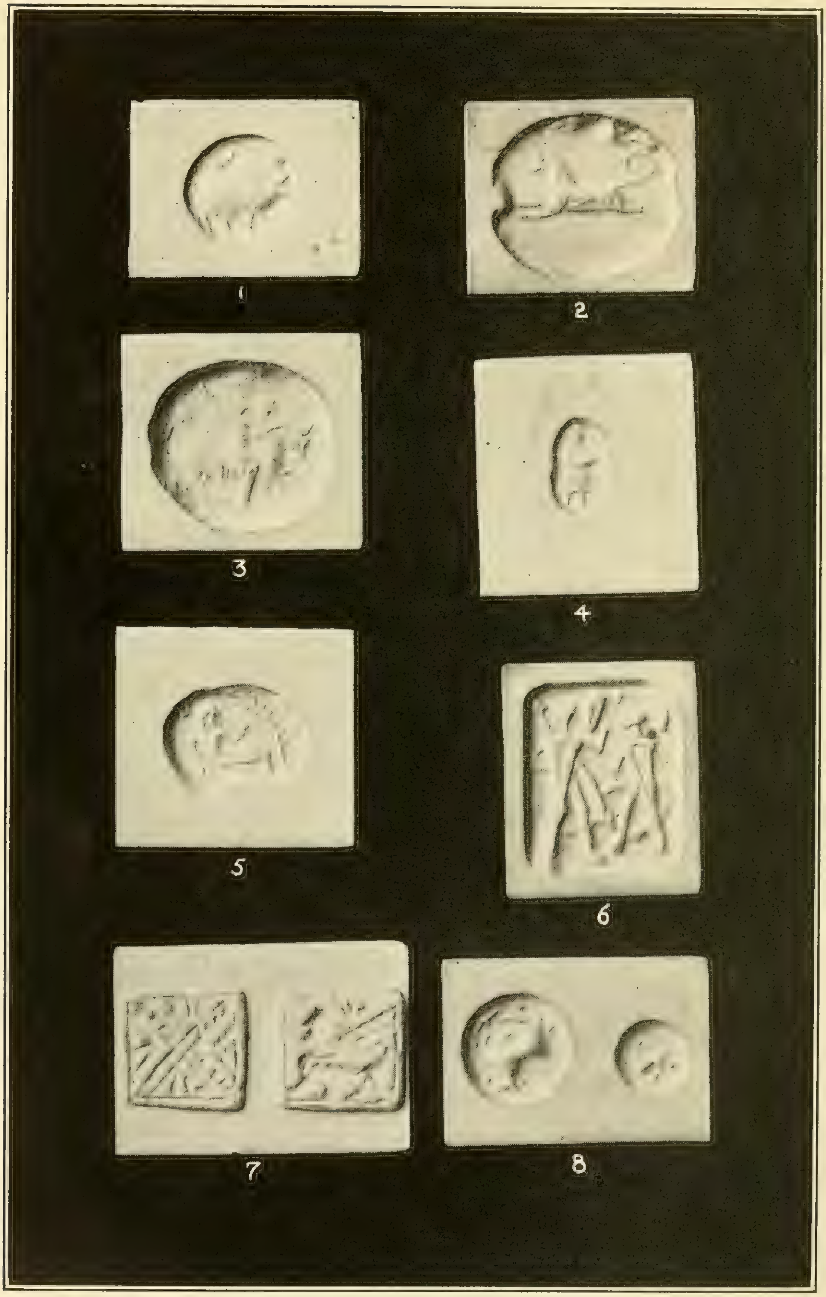
ANCIENT ORIENTAL SEALS

FOR EXPLANATION OF PLATE SEE PAGES 21 AND 22



ANCIENT ORIENTAL SEALS

FOR EXPLANATION OF PLATE SEE PAGE 22



ANCIENT ORIENTAL SEALS

FOR EXPLANATION OF PLATE SEE PAGES 22 AND 23

CATALOGUE OF HUMAN CRANIA IN THE UNITED STATES NATIONAL MUSEUM COLLECTIONS

By Aleš Hrdlička[1]

Curator, Division of Physical Anthropology, United States National Museum

This part has been prepared for the press since the end of 1924.

It brings data on six important groups of the North American Indians. The total number of skulls comprised is 1,350, subdivided as follows: The Algonkin and related Iroquois, 563 crania; the Siouan tribes, 285 crania; the Caddoes, 15 crania; the Salish and Sahaptin, 15 crania; the Shoshonean, 69 crania; and the Californians, 403 crania.

In the preparation of the part the author has been assisted by his aides, Dr. Paul Van Natta and Mr. Dale Stewart.

To make the data as serviceable as possible, which is the main object of the laborious and rather thankless task, the author's records on crania preserved in other institutions have also been included.

Some wishes have been voiced that additional measurements be given, on the face, palate, etc. These wishes have received earnest consideration, and it is hoped that they may to some extent at least be complied with in the future. To do so now is a physical impossibility.

It may be well to say here again that the object for publishing these detailed data and the justification of the expense involved in their publication is to make available to students in all lands reliable essentials on the rich collections of the United States National Museum, supplemented with such records on material in other institutions as the author has in the course of years been able to gather. Such data can not but be of substantial use in anthropological studies of every nature, above all in those on human variation.

The series are arranged throughout in ascending scale by the cephalic index. They give the size and shape of the vault, face, nose, and orbits, which comprises the first and indispensable information the student needs about every skull. Other measurements on the

[1] See also first section of this catalogue on the Mongolians, Eskimo, Aleuts, and Alaska Indians in the Proceedings of the U. S. National Museum, vol. 63, art. 12, published on March 14, 1924.

vault, face, and lower jaw are surely of value and might be of the utmost use to a given worker at a given time; these must receive attention as time and circumstances will permit.

Much of such additional data is already on hand and will be gladly furnished to workers who may need them, on application. Besides this, well-qualified students are earnestly invited to make all needed further use of the national collections in this line. They will be given all possible facilities and assistance.

Aleš Hrdlička.

ABBREVIATIONS

A. M. N. H.=American Museum of Natural History, New York.
A. N. S. P.=Academy of Natural Sciences, Philadelphia.
B. S. N. H.=Buffalo Society of Natural History.
C. I. P.=Carnegie Institute, Pittsburgh.
D. A. S.=Davenport Academy of Sciences, Iowa.
F. M. N. H.=Field Museum of Natural History, Chicago.
P. A.=Phillips Academy, Andover, Mass.
P. M. C.=Peabody Museum, Cambridge, Mass.
U. of C.=Museum of the University of California, San Francisco.
U. S. N. M.=United States National Museum.
V. M.=Valentine Museum, Richmond, Va.
Wist. Inst.=Wistar Institute of Anatomy and Biology, Philadelphia.

ALGONKINS AND IROQUOIS

Huron Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
274,245	U. S. N. M.	Rice Lake, Ontario, Canada.	24		19.5	13.2	14	*67.7*
274,241	do	Clearville, Kent County, Ontario, Canada.	45		19.2	13.2	13.7	*68.7*
239,111	do	Southeast Ontario, Canada.	40		19.3	13.8	14.7	*71.5*
228,900	do	do	60		19.7	14.2	13.6	*72.1*
239,105	do	do	75		18.6	13.5	13.8	*72.6*
239,110	do	do	80		18.6	13.6	13.4	*73.1*
272,246	do	do	28		18.8	13.9	13.5	*73.9*
272,242	do	do	24		18.3	13.6	13.6	*74.3*
239,107	do	do	50		18.8	14	13.6	*74.5*
239,112	do	do	55		18.3	13.7	14.1	*74.9*
239,109	do	do	60		18.9	14.2	13.8	*75.1*
239,108	do	do	60		18.8	14.2	13.5	*75.5*
239,113	do	do	65		18.6	14.2	13.6	*76.3*
239,106	do	do	35		18.4	14.2	13	*77.2*
239,104	do	do	60		18.2	14.6	14.3	*80.2*
					(15)	(15)	(15)	(15)
Totals					182	208.10	206.20	
Averages					*18.80*	*13.87*	*13.75*	*73.8*
Minima					18.20	13.2	13	67.7
Maxima					19.70	14.6	14.7	80.2

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
239,103	U. S. N. M.	Huron County, Ontario, Canada.	Adult		17.5	13.0	12.5	*74.3*
305,792	do	Simcoe County, Ontario.	do		18.4	13.8	13.9	*75.5*
2,141	A. N. S. P.	County unknown	do		18.2	13.7	13.8	*75.3*
305,789	U. S. N. M.	Simcoe County, Ontario.	do		17.3	13.3	13.0	*76.9*
305,791	do	do	do		17.8	13.7	13.6	*77*
305,790	do	do	do		17.6	13.7	13.4	*77.8*
239,102	do	do	do		17.3	13.5	13.9	*78*
1,218	A. N. S. P.		do		17.3	13.6	13.8	*78.6*
272,243	U. S. N. M.	Simcoe County, Ontario	do		17.4	13.7	12.4	*78.7*
					(9)	(9)	(9)	(9)
Totals					158.8	122	120.3	
Averages					*17.64*	*13.55*	*13.36*	77

ALGONKINS AND IROQUOIS

Huron Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
85.6	15.56	------	------	7.2	13.5	------	53.3	3.65	4.15	87.9	5.4	2.5	46.3
84.6	15.36	------	------	8	14.9	------	53.7	3.55	4.1	86.6	5.7	2.7	47.4
88.8	15.93	------	------	------	------	------	------	------	------	------	------	------	------
80.2	15.83	------	------	8	14	------	57.1	3.35	3.9	85.9	5.8	2.1	48.3
86	15.30	------	------	------	14.4	------	------	3.23	4.1	78.7	5.1	2.8	54.9
83.2	15.20	------	------	------	------	------	------	------	------	------	------	------	------
82.6	15.40	------	------	7.7	13.5	------	57	3.55	4	88.7	5.2	2.5	48.1
85.3	15.16	------	------	------	------	------	------	------	------	------	------	------	------
82.9	15.46	------	------	------	13.8	------	------	3.5	3.75	93.3	------	------	------
88.1	15.36	------	------	------	------	------	------	------	------	------	------	------	------
83.4	15.63	------	------	8.4	14.9	------	56.4	3.52	3.82	92.2	5.9	2.8	47.5
81.8	15.50	------	------	7.4	13.9	------	53.2	3.52	4.07	86.5	5.35	2.65	49.5
82.9	15.46	------	------	------	------	------	------	3.6	3.9	92.3	------	------	------
79.8	15.20	------	------	7	14.3	------	49	3.57	4	89.4	5.2	2.7	51.9
87.2	15.70	------	------	8.3	------	------	------	3.45	3.85	89.6	6.1	2.9	47.5
(15)	(15)	------	------	(8)	(9)	------	(7)	(11)	(11)	(11)	(9)	(9)	(9)
------	232.05	------	------	62	127.20	------	------	38.49	43.64	------	49.75	23.65	------
84.1	15.47	------	------	7.75	14.13	------	54.2	3.5	3.97	88.2	5.53	2.63	47.5
79.8	15.16	------	------	7	13.5	------	49	3.23	3.75	78.7	5.1	2.1	46.3
88.8	15.93	------	------	8.4	14.9	------	57.1	3.65	4.15	93.3	6.1	2.9	54.9

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total*	*Facial Index, upper*	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
81.9	14.33	1,340	------	6.5	12.1	------	53.7	3.18	3.78	84.1	4.6	2.45	53.3
86.3	15.37	------	------	7.4	14.2	------	52.1	3.6	3.97	90.7	5.5	2.8	50.9
86.5	15.23	------	------	6.7	12.7	------	52.8	3.4	3.75	90.1	5.0	2.95	59
85	14.53	1,260	------	------	------	------	------	3.4	3.8	89.5	4.9	2.5	51.0
86.4	15.03	1,410	------	7.6	------	------	------	3.58	3.98	89.9	5.5	2.9	52.7
85.6	14.90	1,380	------	------	------	------	------	------	------	------	------	2.7	------
90.3	14.90	1,280	------	7.2	------	------	------	------	------	------	5.4	2.75	50.9
89.3	14.90	------	------	7.1	12.8	------	55.5	3.55	3.72	95.4	5.2	2.5	48.1
79.7	14.50	1,425	------	6.3	12.7	------	49.6	3.37	3.72	90.6	4.8	2.7	56.2
(9)	(9)	(6)	------	(7)	(5)	------	(5)	(7)	(7)	(7)	(8)	(9)	(8)
------	133.69	8,095	------	48.8	64.5	------	------	24.08	26.72	------	40.9	24.25	------
85.7	14.85	1,349	------	6.97	12.9	------	52.7	3.44	3.81	90.1	5.11	2.69	52.7

Maine Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
14,173	P. M. C	Deer Island, Me	Adult		19.5	13.6	14.0	*69.7*
58,590	do	North Haven, Me	do		20.0	14.2	14.2	*71*
47,942	do	Kennebeck River, Me.	do		18.6	13.5	13.8	*72.6*
29,526	do	Fort Island, Me	do		18.5	13.6	12.7	*73.5*
12,349	do	Great Deer Island, Me.	do		19.0	14.2	13.9	*74.7*
57,962	do	West Goldsborough, Me.	do		18.8	14.1	13.6	*75*
					(6)	(2)	(6)	(6)
Totals					114.4	83.2	82.2	
Averages					*19.07*	*13.87*	*13.70*	*72.7*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
15,309	P. M. C	Damariscotta, Me.	Adult		18.4	13.5		*73.4*
33,714	do	do	do		18.2	13.5	12.7	*74.2*
57,961	do	do	do		18.2	13.6	13.3	*74.7*
26,243	do	Fort Island, Me	do		18.4	13.8	13.6	*75*
12,350	do	Great Deer Island, Me.	do		17.9	13.5	12.6	*75.4*
89	A. N. S. P	"Penobscot," Me.	do		17.4	13.2	13.9	*75.9*
					(6)	(6)	(5)	(6)
Totals					108.5	81.10	66.1	
Averages					*18.08*	*13.52*	*13.22*	*74.8*

[1] Right.

Massachusetts (State) Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
10,249	P. M. C	Salem, Mass	Adult		19.7	[1] 13.6	[1] 14.0	*69*
38,897	P. A	Lawrence, Mass	do		19.1	13.4	14.2	*70.2*
11,249	P. M. C	West Andover, Mass.	do		19.0	13.4	13.6	*70.5*
227,472	U. S. N. M	Roxbury, Mass	do		18.4	13.0	14.0	*70.7*
32,563	P. M. C	Connecticut River, Mass.	do		19.1	13.7		*71.7*
59,488	do	Marthas Vineyard, Mass.	do		18.9	13.7	14.2	*72.5*
227,473	U. S. N. M	Roxbury, Mass	do		19.0	13.9	14.2	*73.2*
43	P. M. C	Newburyport, Mass.	do		19.8	14.5	14.2	*73.2*
10,230	do	Saugus, Mass	do		18.7	13.7	13.2	*73.3*
25,299	do	Revere, Mass	do		19.2	14.1	14.2	*73.4*
33,434	do	Marion, Mass	do		18.6	13.8	14.5	*74.2*
57,383	do	Quincy, Mass	do		18.4	13.8		*75*
1/1981	A. M. N. H	Medford, Mass	do		18.1	13.7	12.6	*75.7*
110	A. N. S. P	Nantucket, Mass	do		19.0	14.6	14.4	*76.8*
					(14)	(14)	(12)	*(14)*
Totals					265	192.9	167.3	
Averages					*18.93*	*13.78*	*13.94*	*72.8*
Minima					18.1	13	12.6	*69*
Maxima					19.8	14.6	14.5	*76.8*

[1] Near.

Maine Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
84.6	15.70	-------	13.0	7.9	-------	-------	-------	3.6	3.9	*91*	5.6	2.4	*42.9*
83	16.13	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
86	15.30	-------	-------	-------	-------	-------	-------	[1]3.2	[1]4.1	*78*	4.6	2.4	*52.2*
79.1	14.93	-------	-------	7.2	13.5	-------	*53.3*	3.3	3.92	*84.2*	5.2	2.1	*40.4*
83.7	15.70	-------	-------	7.1	13.4	-------	*53*	3.4	3.68	*92.4*	4.9	2.35	*48*
82.7	15.50	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
(*6*) *83.2*	(6) 93.26 *15.54*	-------	-------	(3) 22.2 7.4	(2) 26.9 13.45	-------	(*2*) *55*	(4) 13.5 *3.37*	(4) 15.6 *3.90*	(*4*) *86.4*	(4) 20.3 *5.07*	(4) 9.25 *2.31*	(*4*) *45.6*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
77.7	14.80	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
83.6	15.03	-------	11.8	7.2	13.3	*88.7*	*54.1*	3.2	3.9	*82.1*	5.2	2.5	*48.1*
84.5	15.26	-------	11.7	6.9	13.0	*90*	*53.1*	3.4	3.82	*89*	4.8	2.5	*52.1*
80.2	14.66	-------	11.4	6.6	12.6	*90.5*	*52.4*	3.2	3.6	*88.9*	4.9	2.45	*50*
90.8	14.83	-------	-------	6.6	12.9	-------	*51.2*	3.32	3.9	*85.1*	4.7	2.35	*50*
(*5*) *83.7*	(5) 74.58 *14.92*	-------	(3) 34.9 *11.63*	(4) 27.3 *6.82*	(4) 51.8 *12.95*	(*3*) *89.8*	(*4*) *52.7*	(4) 13.12 *3.28*	(4) 15.22 *3.80*	(*4*) *86.3*	(4) 19.6 *4.9*	(4) 9.8 *2.45*	(*4*) *50*

Massachusetts (State) Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
84.1	15.77	-------	-------	7.5	-------	-------	-------	[2]3.4	[2]4.0	*85*	5.1	2.55	*50*
87.4	15.57	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
84	15.33	-------	-------	7.6	[1]14	-------	*54.3*	3.47	4.0	*86.7*	5.3	2.5	*47.2*
89.2	15.13	1,415	-------	7.4	[1]13.9	-------	*53.2*	3.25	4.1	*79.3*	5.25	2.6	*49.5*
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
87.1	15.60	-------	-------	-------	13.8	-------	-------	3.23	3.95	*81.8*	5.0	2.3	*46*
86.3	15.70	1,600	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
82.8	16.17	-------	-------	-------	-------	-------	-------	3.5	4.0	*87.5*	5.1	2.4	*47.1*
81.5	15.20	-------	-------	7.1	-------	-------	-------	[2]3.5	[2]4.15	*84.3*	5.0	2.5	*50*
85.3	15.85	-------	11.9	7.3	[1]13.9	*85.6*	*52.5*	3.4	3.8	*89.5*	5.2	2.8	*53.8*
89.5	15.63	-------	12.7	7.5	13.0	*97.7*	*57.7*	3.48	3.75	*92.8*	5.2	2.9	*55.8*
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
76.8	14.80	-------	-------	6.8	12.9	-------	*52.7*	3.2	3.7	*86.5*	5.0	2.5	*50*
85.7	16.00	-------	13.6	8.0	14.5	*93.8*	*55.2*	3.77	4.2	*89.8*	5.6	2.65	*47.3*
(*12*) *85.3* *76.8* *89.5*	(12) 186.75 *15.56* 14.80 16.17	(2) 3,015 *1,507* -------	(3) 38.2 *12.73* 11.9 16.6	(8) 59.2 *7.4* 6.8 8	(7) 96 *13.71* 12.9 14.5	(*3*) *92.8* *85.6* *97.7*	(*6*) *54* *52.5* *57.7*	(10) 34.2 *34.2* 3.2 3.77	(10) 39.65 *3.96* 3.7 4.2	(*10*) *86.4* *79.3* *92.8*	(10) 51.75 *5.17* 5 5.6	(10) 25.7 *2.57* 2.3 2.9	(*10*) *49.7* *46* *55.8*

[2] Right.

Massachusetts (State) Indian crania—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
660	P. M. C.	Beverley, Mass.	Adult		18.8	13.0	13.0	*69.1*
24,851	do	Salem, Mass.	do		18.3	12.8	12.4	*70.0*
56,350	P. A.	Lawrence, Mass.	do		18.0	12.7	13.5	*70.6*
18,225	P. M. C.	Swampscott, Mass	do		18.1	12.8		*70.7*
18,881	do	Beverley, Mass.	do		18.3	13.0	13.1	*71.0*
10,229	do	Saugus, Mass.	do		18.1	12.9	[1] 13.3	*71.3*
15,378	do	Revere, Mass.	do		18.0	13.0	13.5	*72.2*
2	do	Hingham, Mass.	do		17.4	12.7	13.0	*73.0*
"X"	do	Mendon, Mass.	do		17.7	13.0	13.7	*73.4*
567	A. N. S. P.	"Naumkeag," Mass.	do		17.8	13.2	13.2	*74.2*
45,648	P. M. C.	Winthrop, Mass.	do		18.2	13.5		*74.2*
302,779	U. S. N. M.	Quincy, Mass.	do		18.0	13.4	13.4	*74.4*
204,875	do	New Bedford, Mass	do		16.9	12.6	12.4	*74.6*
1,595	P. M. C.	Wellesley, Mass.	do		18.4	13.8	13.4	*75*
48,019	do	Chelsea, Mass.	do		17.1	12.9	14.4	*75.4*
37,924	do	Long Meadow, Mass.	do		17.1	13.0	12.4	*76*
1,371	A. M. N. H.	Massachusetts	do		17.1	13.0	13.2	*76*
10,231	P. M. C.	Saugus, Mass.	do		17.3	13.2	13.0	*76.3*
479	do	"Chickopee," Mass.	do		17.8	13.7		*76.9*
103	A. N. S. P.	"Na Fick," Mass.	do		17.2	13.4	14.4	*77.9*
10,246	P. M. C.	Marblehead, Mass	do		18.1	14.1	13.2	*77.9*
33,435	do	Marion, Mass.	do		17.4	13.6	14.0	*78.2*
56,669	do	Winthrop, Mass.	do		17.1	13.4	13.9	*78.4*
248,326	U. S. N. M.	Marthas Vineyard, Mass.	do		17.6	13.8	13.2	*78.4*
47,948	P. M. C.	West Newton, Mass.	do		17.0	13.4	13.7	*78.8*
104	A. N. S. P.	"Natick," Mass.	do		17.4	13.9	13.2	*79.9*
					(26)	(26)	(23)	*(26)*
Totals					460.2	343.8	306.5	
Averages					*17.70*	*13.22*	*13.33*	*74.7*
Minima					16.9	12.6	12.4	*69.1*
Maxima					18.8	14.1	14.4	*79.9*

[1] Near.

Rhode Island Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. anteroposterior maxim. (glabella ad maximum).	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
41,763	P. A.	Rhode Island	Adult		18.8	12.9	13.6	*68.6*
951	A. N. S. P.	"Narraganset," R. I.	do		18.6	13.3	12.7	*71.5*
950	do	do	do		18.5	13.5	13.1	*73*
952	do	do	do		18.6	13.8	14.3	*74.2*
957	do	do	do		18.2	14.0	14.2	*76.9*
956	do	do	do		17.9	14.0	14.0	*78.2*
					(6)	(6)	(6)	*(6)*
Totals					110.6	81.5	81.9	
Averages					*18.43*	*13.58*	*13.65*	*73.7*

[1] Near.

Massachusetts (State) Indian crania—Continued

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
81.1	14.93			7.2				[2] 3.35	[2] 3.75	89.3	5.2	2.15	41.4
79.8	14.50												
88	14.73							3.0	3.7	81.1	4.7	2.4	51.1
								3.4	3.8	89.5	5.0	2.4	48
83.7	14.80		11.4	7.0	12.8	89.1	54.7	3.48	3.93	88.3	5.1	2.3	45.1
85.8	14.76			6.5				3.3	3.72	88.7	4.5	2.3	51.1
87.1	14.83			7.0	12.7		55.1	3.27	3.67	89.1	5.1	2.7	52.9
86.4	14.36			7.3				3.4	3.85	88.3	5.0	2.4	48
89.2	14.60			6.1				3.3	4.0	82.5	4.7	2.6	55.3
85.2	14.73			7.2				3.15	3.8	82.9	5.0	2.45	49
				7.1									
85.4	14.93	1,360		6.9	12.3		56.1	3.33	3.74	89.0	4.7	2.5	53.2
84.1	13.96	1,240		7.2	12.7		56.7	3.45	3.62	95.3	5.3	2.4	45.3
83.2	15.20			7.0				3.4	3.9	87.2	4.8	2.4	50
96	14.80			7.5	13.0		57.7	3.45	3.78	91.3	5.2	2.7	51.9
82.4	14.17												
87.7	14.43		11.6	7.3	12.3	94.3	59.3				4.95		
85.2	14.50			7.0	12.5		56	3.45	3.65	94.5	5.1	2.25	41.1
				6.7				3.3	4.0	82.5	5.0	2.7	54
94.1	15.00										4.7	2.2	46.8
82	15.13							3.25	3.85	84.4	5.0	2.65	53
90.3	15.00				12.9			3.25	3.80	85.5	4.9	2.5	51
91.2	14.80										5.0	2.45	49
84.1	14.87	1,415						3.4	[2] 3.75	90.7	5.05	2.6	51.5
90.1	14.70												
84.4	14.83		11.3	7.0	12.9	87.6	54.3	3.75	3.75	100	5.1	2.7	52.9
(23)	(23)	(3)	(3)	(16)	(9)	(3)	(8)	(19)	(19)	(19)	(22)	(21)	(21)
	338.56	4,015	34.3	112	14.1			63.68	72.06		109.1	51.75	
86.2	14.72	1,338	11.43	7	12.68	89.9	55.2	3.35	3.79	88.4	4.96	2.46	49.6
79.8	13.96	1,240	11.3	6.1	12.3	87.6	54.3	3	3.62	81.1	4.5	2.15	41.1
96	15.20	1,415	11.6	7.5	13	94.3	59.3	3.75	4	100	5.3	2.7	55.3

[2] Right.

Rhode Island Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
85.8	15.10		11.9	7.2	[1] 13.6	87.5	52.9	3.27	3.55	92.1	5.2	2.5	48.1
79.6	14.87			7.2	12.8		56.2	3.33	3.8	87.6	5.2	2.9	55.8
81.9	15.03				13.3			3.5	3.9	89.7	5.0	2.5	50
88.3	15.57				12.7			3.45	4.0	86.2	4.7	2.85	60.6
88.2	15.47			7.7	13.4		57.5	3.8	4.03	94.3	5.2	2.5	48.1
87.8	15.30				14.2			3.63	4.03	90.1	4.9	2.6	53.1
(6)	(6)			(3)	(6)		(3)	(6)	(6)	(6)	(6)	(6)	(6)
	91.34			22.1	80			20.98	23.31		30.2	15.85	
85.3	15.22			7.37	13.33		55.8	3.50	3.88	90.2	5.03	2.64	52.5

Rhode Island Indian crania—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,940	U. S. N. M	Newport, R. I	Adult		18.5	13.4		*72.4*
15,308	P. M. C	Cumberland River Island, R. I.	do		18.2	13.4	13.0	*73.6*
955	A. N. S. P	"Narraganset," R. I.	do		17.7	13.6	14.2	*76.8*
2,598	P. M. C	Ilverton, R. I	do		17.3	13.4	13.2	*77.5*
2,597	do	do	do		17.2	13.4	13.5	*77.9*
953	A. N. S. P	"Narraganset," R. I.	do		16.8	13.7	13.6	*81.6*
Totals					(6) 105.7	(6) 80.9	(5) 67.5	(6)
Averages					*17.62*	*13.48*	*13.50*	*76.5*

[1] Right.

New Hampshire Indian crania

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
149,042	U. S. N. M	Amoskeag, N. H	Adult		17.8	12.6		*70.8*

Connecticut Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
261,934	U. S. N. M	South Windsor, Conn.	Adult		18.0	[1] 13 4		*71.3*
248,576	do	do	do		19.1	13.7	13.9	*71.7*
261,936	do	East Windsor, Conn.	75		18.0	12.9		*71.7*
2,608	A. M. N. H	Mystic, Conn	Adult		18.7	14.0	13.9	*74.9*
Totals					(4) 73.8	(4) 54	(2) 27.8	(4)
Averages					*18.45*	*13.50*	*13.90*	*73.2*

[1] Near.

Rhode Island Indian crania—Continued

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
----	----	----	----	6.7	----	----	----	[1] 3.3	[1] 4.0	*82.5*	4.9	2.7	*55.1*
82.3	14.87	----	----	----	----	----	----	----	----	----	5.0	2.65	*53*
90.7	15.17	----	----	7.1	13.2	----	*53.8*	3.55	3.95	*89.9*	5.3	2.95	*55.7*
86	14.63	----	10.8	7.0	12.6	*85.7*	*55.6*	3.5	3.63	*97.9*	5.3	2.6	*49.1*
88.2	14.70	----	12.2	7.5	13.3	*91.7*	*56.4*	3.58	3.9	*91.8*	5.2	2.5	*48.1*
89.2	14.70	----	----	6.5	12.6	----	*51.6*	3.37	3.62	*93.1*	4.5	2.6	*57.8*
(5)	(5)	----	(2)	(5)	(4)	(2)	(4)	(5)	(5)	(5)	(6)	(6)	(6)
----	74.07	----	23	34.8	51.7	----	----	17.3	19.1	----	30.2	16	----
86.8	*14.81*	----	*11.5*	*6.96*	*12.92*	*89*	*53.9*	*3.46*	*3.82*	*90.6*	*5.03*	*2.67*	*53.1*

New Hampshire Indian crania

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth. mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
----	----	----	11.2	6.8	----	----	----	3.25	3.6	*90.3*	4.9	2.25	*45.9*

Connecticut Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
84.8	15.57	1,660	----	----	[1] 14	----	----	3.28	[2] 3.85	*85.2*	4.7	2.4	*51.1*
85	15.53	----	----	----	[1] 13.5	----	----	3.2	3.78	*82.5*	5.3	2.5	*47.2*
(2)	(2)	----	----	----	(2)	----	----	(2)	(2)	(2)	(2)	(2)	(2)
----	31.1	----	----	----	27.5	----	----	6.48	7.63	----	10	4.9	----
87	*15.55*	----	----	----	*13.75*	----	----	*3.24*	*3.81*	*85*	*5*	*2.45*	*49*

[2] Right.

Connecticut Indian crania—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
261,935	U. S. N. M.	East Windsor, Conn.	Adult		18.1	12.9		*71.3*
251,922	do	Farmington, Conn	do		18.0	13.2	13.1	*73.3*
2,609	A. M. N. H.	Mystic, Conn.	do		17.9	13.2	13.2	*73.7*
244,097	U. S. N. M.	Hartford, Conn	do		17.4	14.0	13.6	*80.5*
					(4)	(4)	(3)	(4)
Totals					71.4	53.3	39.9	
Averages					*17.85*	*13.32*	*13.30*	*74.6*

[1] Near.

Northwest New York State Indian crania: Iroquois

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
C/3, 103	B. S. N. H.	V. S. S., Grand Island, N. Y.	Adult	Rather abnormal.	19.9	13.6	14.0	*68.3*
C/3, 937	do	Orangeport, N. Y.	do		19.0	13.1	13.7	*69*
C/2, 293	do	Lewiston, N. Y.	do		19.1	13.2	13.7	*69.1*
C/2, 291	do	do	do		19.2	13.4	14.2	*69.8*
C/2, 284	do	do	do		19.4	13.6	14.1	*70.1*
C/2, 302	do	do	do		19.2	13.5	High.	*70.3*
C/2, 294	do	do	do		19.0	13.5	13.9	*71.0*
C/2, 289	do	do	do		19.8	[1] 14.1	High.	*71.2*
C/3, 944	do	East Bloomfield, Ontario County.	do		18.9	13.5	13.5	*71.4*
C/3, 921	do	"Neutral" Ontario County.	do	Slight asymmetry.	19.6	14.0	12.6	*71.4*
C/3, 099	do	Grand Island	do		19.4	13.9	13.7	*71.6*
C/2, 287	do	Lewiston, Niagara County.	do		18.6	13.4	13.4	*72.0*
C/3, 996	do	Richmond, Ontario County.	do		18.6	[1] 13.4	[2] 14.2	*72.0*
C/3, 939	do	East Bloomfield, Ontario County.	do		18.8	13.6	14.2	*72.3*
C/2, 282	do	Lewiston, Niagara County.	do		19.6	14.2	14.2	*72.4*
C/2, 285	do	do	do		19.1	13.9	14.1	*72.8*
C/3, 995	do	Richmond, Ontario County, N. Y.	do		18.4	[1] 13.4	14.0	*72.8*
C/3, 933	do	Orangeport, Niagara County.	do		18.4	13.5	13.6	*73.4*
C/3, 942	do	East Bloomfield, Ontario County,	do		18.8	13.8	14.2	*73.4*
C/1, 836	do	I. M. C., Buffalo, Erie County.	do		18.5	13.6	14.1	*73.5*
C/1, 838	do	do	do		19.0	14.0	12.7	*73.7*
C/3, 932	do	Orangeport, Niagara County.	do		18.7	13.8	14.0	*73.8*
C/1, 859	do	Buffalo, Erie County.	do		18.4	13.6	14.3	*73.9*
C/1, 863	do	do	do		18.4	13.6	13.4	*73.9*
16	A. N. S. P.	Near Lake Erie	do		19.1	14.2	14.5	*74.3*
C/3, 101	B. S. N. H.	Grand Island	do		18.6	14.0	14.0	*75.3*

[1] Near.

Connecticut Indian crania—Continued

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
83.9	14.77	1,240		7.1	13.2		*53.8*	3.35	3.8	*88.2*	5.1	2.6	*51*
84.9	14.77		11	6.6	[1] 11.4	*96.5*	*57.9*	3.3	3.4	*97.1*	4.4	2.6	*59.1*
86.6	15.00	1,350											
(3)	(3)	(2)		(2)	(2)		(2)	(2)	(2)	(2)	(2)	(2)	(2)
	44.54	2,590		13.7	24.6			6.65	7.2		9.5	5.2	
85.4	*14.85*	*1,295*		*6.85*	*12.3*		*55.7*	*3.32*	*3.6*	*92.2*	*4.75*	*2.6*	*54.7*

Northwest New York State Indian crania: Iroquois

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
83.6	15.83			7.4	13.8		*53.6*	3.4	3.8	*89.5*	5.35	2.8	*52.3*
85.4	15.26			[2] 7.9	[1] 13.4		*59*						
84.8	15.33			7.6	[1] 14.3		*52.1*	3.45	4.0	*87.5*	5.55	2.65	*57.8*
87.1	15.60				[1] 14.2			3.37	3.72	*90.6*	5.7	2.9	*50.9*
85.4	15.70			7.4	14.1		*52.5*	3.47	4.02	*86.3*	5.35	2.85	*53.3*
				7.7	14.2		*54.2*	3.4	3.95	*86.1*	5.4	2.65	*49.1*
85.5	15.47			7.3	[1] 14.2		*51.4*	3.55	4.05	*87.7*	5.1	2.75	*53.9*
				7.8	[2] 14		*55.7*	3.35			5.4	2.65	*49.1*
83.3	15.30			7.6	[1] 13.3		*57.1*	3.65			5.6	2.8	*50*
75	15.46		12.1	7.4	13.4	*90.3*	*55.2*	3.1	3.6	*86.1*	5.4	2.9	*53.*
82.3	15.67				[1] 13.8			3.42	4.05	*84.9*	5.15	3.0	*58.3*
83.8	15.13							3.4	4.07	*83.5*	5.1	2.75	*53.9*
88.8	15.40			7.4							5.3	2.4	*45.3*
87.6	15.53												
84.0	16.00			7.7	14.7		*52.4*	3.22	3.95	*81.5*	5.5	3.05	*55.5*
85.4	15.70			7.1	13.8		*51.4*	3.15	3.8	*82.9*	4.8	2.55	*53.1*
88.0	15.26							3.45	3.87	*89.2*	5.3	2.85	*53.8*
85.3	15.17			[2] 7.7	[1] 13.4		*57.5*	3.3	3.9	*84.6*	5.1		
87.1	15.60												
87.9	15.40			6.9	13.9		*49.6*	3.2	4.02	*79.5*	5.3	2.9	*54.7*
77	15.23			7.5	13.6		*55.2*	3.4	3.9	*87.2*	5.65	2.85	*50.4*
86.2	15.50												
89.4	15.43		11.8	7.0	[2] 13.4	*(88.1)*	*(52.2)*	3.5	4.02	*87.1*	5.2	2.55	*47.2*
83.8	15.13			7.7	[1] 13.4		*57.5*	3.3	3.72	*88.7*	5.4	2.5	*46.3*
87.1	15.93			7.8				3.6	3.87	*92.9*	5.5	2.55	*46.4*
85.9	15.53			7.4	13.7		*54.0*	3.35	3.8	*88.2*	5.3	2.6	*49.1*

[2] About.

Northwest New York State Indian crania; Iroquois—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
C/1, 837	B. S. N. H.	Buffalo	Adult		18.4	13.9	14.1	*75.5*
C/2, 286	do	Lewiston, Niagara County.	do		18.4	14.0	14.5	*76.1*
989	A. N. S. P.	Near Lake Erie	do		18.4	14.0	14.3	*76.1*
C/1, 849	B. S. N. H.	Buffalo	do		18.6	14.3	13.7	*76.9*
C/3, 100	do	Grand Island	do		18.3	14.1	13.7	*77.0*
C/2, 297	do	Lewiston	do		18.8	14.5	14.3	*77.1*
C/3, 936	do	Orangeport	do		18.0	14.2	13.7	*78.9*
					(33)	(33)	(31)	(*33*)
Totals					622.4	454.4	430.6	
Averages					*18.86*	*13.77*	*13.89*	*73*
Minima					18	13.1	12.6	*68.3*
Maxima					19.9	14.5	14.5	*78.9*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
C/3, 098	B. S. N. H.	Grand Island	Adult		19.1	13.1	12.5	*68.6*
C/1, 858	do	Im. Cem., Buffalo	do		17.2	12.0	13.0	*69.8*
C/3, 934	do	Orangeport	do		18.0	12.7	13.9	*70.6*
C/2, 296	do	Lewiston	do		18.7	13.3	13.5	*71.1*
C/2, 288	do	do	do		18.6	13.3	13.6	*71.5*
C/3, 924	do	"*Neutral*," Humberton.	do		17.9	12.8	12.7	*71.5*
C/3, 935	do	Orangeport, Niagara County.	do		17.6	12.7	13.7	*72.2*
C/2, 298	do	Lewiston	do		18.8	13.6	13.3	*72.3*
C/3, 938	do	Grand Island	do		17.6	12.8	13.0	*72.7*
C/1, 847	do	Buffalo	do		17.8	13.0	12.7	*73.0*
C/2, 299	do	Lewiston	do		18.1	13.4	13.6	*74.0*
C/2, 300	do	do	do		17.8	13.2		*74.2*
C/1, 846	do	Buffalo	do		17.8	13.2	12.7	*74.2*
C/2, 292	do	Lewiston	do		18.1	13.6	13.8	*75.1*
C/3, 940	do	Grand Island	do		17.7	13.3	13.4	*75.1*
119	A. N. S. P.	Near Lake Erie	do		18.3	13.8	13.7	*75.4*
C/2, 283	B. S. N. H.	Lewiston	do		17.6	13.4	13.8	*76.1*
C/2, 290	do	do	do		16.7	12.8	13.0	*76.6*
C/1, 848	do	Buffalo	do		18.0	13.8	13.7	*76.7*
C/1, 860	do	do	do		17.7	13.6	14.2	*76.8*
C/3, 927	do	Richmond Mills	do		17.4	13.4	12.6	*77.0*
C/2, 295	do	Lewiston	do		17.4	13.6	13.4	*78.2*
C/3, 941	do	East Bloomfield, Ontario County.	do		17.5	13.9	13.1	*79.4*
C/3, 945	do	Victor	do		17.4	14.2	12.9	*81.6*
					(24)	(24)	(23)	(*24*)
Totals					428.8	318.5	305.8	
Average					*17.87*	*13.27*	*13.30*	*74.3*
Minima					16.7	12	12.5	*68.6*
Maxima					19.1	14.2	14.2	*81.6*

[1] Near.

Northwest New York State Indian crania; Iroquois—Continued

MALE—Continued

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
87.3	15.47	------	------	7.3	13.6	------	53.7	3.4	3.9	87.2	5.3	2.6	49.1
89.5	15.63	------	------	------	------	------	------	------	------	------	5.4	2.7	50
88.3	15.57	------	------	------	13.7	------	------	3.6	3.98	90.2	5.7	2.75	48.3
83.3	15.53	------	------	------	14.3	------	------	3.35	3.72	90.1	5.4	2.85	52.8
84.6	15.37	------	------	7.4	14.2	------	52.1	3.32	3.9	85.2	5.2	2.9	55.8
85.9	15.87	------	------	------	------	------	------	------	------	------	------	------	------
85.1	15.30	------	------	------	------	------	------	------	------	------	------	------	------
(31)	(31)	------	(2)	(21)	(23)	------	(18)	(25)	(23)	(23)	(27)	(26)	(26)
------	480.3	------	23.9	157	318.4	------	------	84.7	89.61	------	144.45	71.3	------
85.2	15.49	------	11.95	7.48	13.84	------	54.1	3.39	3.90	86.9	5.35	2.74	51.2
75	15.13	------	------	6.9	13.3	------	49.6	3.1	3.6	79.5	4.8	2.4	45.3
89.5	16	------	------	7.9	14.7	------	59	3.65	4.07	92.9	5.7	3.05	58.3
						FEMALE							
77.6	14.90	------	------	------	13.1	------	------	3.37	3.92	86	------	------	------
89.0	14.07	------	------	6.9	------	------	------	3.35	3.72	90.1	4.95	2.55	51.6
90.6	14.87	------	------	------	------	------	------	------	------	------	------	------	------
84.4	15.17	------	------	7.1	------	------	------	------	------	------	5.05	2.8	55.4
85.3	15.17	------	------	6.95	13.4	------	51.9	3.17	3.65	86.8	5.2	2.85	54.8
82.7	14.47	------	------	7.0	13.2	------	53.0	3.42	3.8	90	5.1	2.45	48.0
90.4	14.67	------	------	------	13.4	------	------	------	------	------	------	------	------
82.1	15.23	------	------	------	------	------	------	------	------	------	------	------	------
85.5	14.47	------	------	------	[1] 12.9	------	------	3.32	4.12	80.7	5.15	2.6	52.3
82.5	14.50	------	------	6.9	[1] 12.2	------	56.6	3.32	3.82	86.9	4.9	[1] 2.4	49.0
86.4	15.03	------	------	------	------	------	------	------	------	------	------	------	------
------	------	------	------	6.8	[1] 13.0	------	52.3	3.3	3.9	84.6	4.9	2.65	54.1
81.9	14.57	------	11.8	7.2	12.3	95.9	58.5	3.25	3.6	90.3	5.1	2.55	50
87.1	15.17	------	------	6.85	[1] 13.2	------	51.9	3.37	3.87	87.1	4.95	2.6	52.5
86.4	14.80	------	------	6.9	[1] 13.0	------	53.1	3.28	3.9	84.1	4.75	2.6	54.7
85.4	15.27	------	------	7.0	[1] 12.9	------	54.3	3.35	3.7	90.5	5.1	2.6	51
89.0	14.93	------	------	6.7	[1] 12.5	------	53.6	3.3	3.63	90.9	4.7	2.3	48.9
88.1	14.17	------	------	6.45	[1] 12.9	------	50	3.22	[1] 3.55	90.7	4.75	2.7	56.8
86.2	15.17	------	------	7.3	12.7	------	57.5	------	------	------	------	------	------
90.7	15.17	------	------	7.2	[2] 13.0	------	55.4	3.4	3.73	91.2	5.15	2.5	48.5
81.8	14.47	------	10.6	6.7	12.3	86.2	54.6	3.28	3.65	89.9	5.0	2.7	54
86.4	14.80	------	------	7.45	13.0	------	57.3	3.55	[1] 3.85	92.5	5.35	2.65	49.5
83.4	14.83	------	------	------	13.3	------	------	3.3	3.82	86.4	4.55	2.7	59.3
81.6	14.83	------	------	6.9	13.0	------	53.1	3.57	3.68	97.0	4.9	2.45	50
(23)	(23)	------	(2)	(17)	(19)	(2)	(15)	(18)	(18)	(18)	(18)	(18)	(18)
------	340.73	------	22.4	118.3	245.3	------	------	60.12	67.91	------	89.55	46.65	------
85.4	14.81	------	11.2	6.96	12.91	91.1	53.9	3.34	3.77	91.2	4.97	2.59	52.1
77.6	14.07	------	------	6.45	12.2	------	50	3.17	3.55	80.7	4.55	2.3	48
90.7	15.27	------	------	7.45	13.4	------	58.5	3.57	4.12	97	5.35	2.85	59.3

[1] About.

New York State Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
226, 342	U. S. N. M.	New York	Adult		19.2	13.1	-------	*68.2*
417	A. N. S. P.	"Cayuga"	do		19.8	13.6	13.8	*68.7*
243, 535	U. S. N. M.	Union Springs	do		20.4	14.3	-------	*70.1*
243, 530	do	do	do		19.9	14.0	13.8	*70.4*
20/2335	A. M. N. H.	Croton on Hudson	do		18.9	13.4	14.2	*70.9*
38, 962	P. M. C.	Cayuga County	do		19.2	14.2	14.0	*74*
225, 506	U. S. N. M.	Union Springs	do		18.9	14.0	13.3	*74.1*
"Y"	A. M. N. H.	Astoria	do		18.5	13.7	-------	*74.1*
38, 963	do	Cayuga County	do		18.6	13.8	14.5	*74.2*
896	A. N. S. P.	"Mohawk," Manheim.	do		18.6	13.8	13.6	*74.2*
243, 531	U. S. N. M.	Union Springs	do		18.8	14.0	13.0	*74.5*
3, 688	A. M. N. H.	Van Courtlandt Park.	do		18.8	14.1	14.3	*75*
225, 513	U. S. N. M.	Venice	do		18.4	13.8	13.3	*75*
226, 341	do	New York	do		19.0	14.4	14.4	*75.8*
225, 509	do	Genoa	do		19.2	14.6	14.6	*76*
20/2433	A. M. N. H.	Croton on Hudson	do		18.4	14.3	14.1	*77.7*
276, 734	U. S. N. M.	Binghamton, N. Y.	do		17.8	14.0	13.0	*78.6*
225, 503	do	Union Springs	do	Slight lateral occipital compression.	18.3	14.4	13.7	*78.7*
3, 687	A. M. N. H.	Van Courtlandt Park.	do		18.7	14.9	14.0	*79.7*
					(19)	(19)	(16)	*(19)*
Totals					359.40	266.40	221.60	-------
Averages					*18.92*	*14.02*	*13.85*	*74.12*
Minima					17.80	13.10	13.00	*68.20*
Maxima					20.40	14.90	14.60	*79.70*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
286, 680	U. S. N. M.	Ontario County	Adult		17.5	12.0	[1] 13.5	*68.6*
225, 511	do	Venice	do		18.3	12.8	11.9	*70*
20/2332	A. M. N. H.	Croton on Hudson	do		17.2	12.2	-------	*71.0*
225, 512	U. S. N. M.	Venice	do		17.4	12.5	12.4	*71.8*
14, 114	P. M. C.	New York	do		18.0	13.4	12.4	*74.4*
225, 505	U. S. N. M.	Union Springs	do		18.8	14.0	[1] 13.0	*74.5*
243, 533	do	Balawinsville	do		16.9	12.6	12.9	*74.6*
225, 507	do	Cayuga County	do		18.0	13.6	13.3	*75.6*
227, 807	do	Morses Lane	do		17.8	13.5	12.9	*75.8*
226, 003	do	Venice	do		18.4	14.0	13.8	*76.1*
99/4101	A. M. N. H.	Shinnecock Hills	do		18.0	13.8	13.8	*76.7*
38, 964	P. M. C.	New York	do		17.5	13.5	13.4	*77.1*
20/2342	A. M. N. H.	Croton on Hudson	do		17.4	13.6	13.2	*78.2*
226, 004	U. S. N. M.	Salmon Creek	do		17.6	13.9	12.8	*79*
208, 041	do	Owego, Tioga County.	do		17.7	14.2	-------	*80.2*
225, 510	do	Cayuga County	do		17.6	14.2	12.8	*80.7*
225, 504	do	Union Springs	do		17.6	14.8	13.8	*84.1*
244, 100	do	do	do		17.2	14.5	13.6	*84.3*
					(18)	(18)	(16)	*(18)*
Totals					318.90	243.10	209.50	-------
Averages					*17.72*	*13.50*	*13.09*	*76.2*
Minima					16.90	12.00	11.90	*68.6*
Maxima					18.80	14.80	13.80	*84.3*

[1] Near.

New York State Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
82.6	15.73				13.6						5.2	2.7	*51.9*
81.4	15.90	1,700	12.3	7.4	13.9	*88.5*	*53.2*	3.35	3.95	*84.8*	5.1	2.8	*54.9*
87.9	15.50		12.4	7.15	13.9	*89.2*	*51.4*	3.22	3.87	*83.2*	4.7	3.0	*63.8*
83.8	15.80												
81.8	15.40	1,430	12.0	7.4				3.4	3.75	*90.7*	5.4	2.85	*52.8*
89.5	15.63		13.1	7.9	14.7	*89.1*	*53.7*	3.35	3.85	*87*	5.5	2.7	*49.1*
84	15.33				13.6								
79.3	15.27	1,490	11.8	6.9	[1] 14.6	*80.8*	*47.3*	3.22	3.8	*84.7*	5.2	2.9	*55.8*
86.9	15.73												
82.6	15.17	1,510			14.0			3.45	4.0	*86.8*	5.1	2.3	*45.1*
86.2	15.93	1,620		[2] 7.9	14.6		*54.1*	3.58	4.05	*88.4*	5.6	2.7	*48.2*
86.4	16.13												
86.2	15.60			7.1	14.1		*50.4*	3.5	3.95	*88.6*	5.2	2.85	*54.8*
81.8	14.93	1,485	11.3	6.8	13.1	*86.3*	*51.9*	3.35	3.8	*88.2*	5.0	2.35	*47*
83.8	15.47	1,475	11.8	7.1	[1] 14.1	*83.7*	*50.4*	3.6	3.95	*91.1*	5.2	2.75	*52.9*
83.3	15.87		12.3	7.3	[1] 15.0	*82*	*48.7*	3.7	4.05	*91.4*	5.05	2.6	*51.5*
(16)	(16)	(7)	(8)	(10)	(12)	*(7)*	*(9)*	(11)	(11)	*(11)*	(12)	(12)	*(12)*
	249.39	10,710	97.00	72.95	169.20			37.72	43.02		62.25	32.50	
84.2	*15.59*	*1,530*	*12.12*	*7.29*	*14.1*	*85.6*	*51.2*	*3.43*	*3.91*	*87.7*	*5.19*	*2.71*	*52.2*
79.3	14.93	1,430	11.30	6.80	13.1	*80.8*	*47.3*	3.22	3.75	*83.2*	4.70	2.30	*45.1*
89.5	16.13	1,700	13.10	7.90	15.0	*89.2*	*54.1*	3.70	4.05	*91.4*	5.60	3.00	*63.8*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
91.5	14.33		[1] 10.9	6.7	12.5	*87.2*	*53.6*	3.4	3.8	*89.5*	4.9	2.8	*57.1*
76.5	14.33	1,200	11.1	6.9	13.3	*83.5*	*51.9*	3.37	3.72	*90.8*	5.1	2.3	*45.1*
				6.3				3.45	3.95	*87.3*	4.65	2.45	*52.7*
82.9	14.10	1,200	10.8	6.6	12.0	*90*	*55*	3.35	3.75	*89.3*	4.95	2.6	*52.5*
79	14.60							3.35	3.85	*87*	4.85	2.7	*55.7*
79.3	15.26	1,460											
87.5	14.13	1,230											
84.2	14.97		11	6.7	12.7	*86.6*	*52.8*	3.25	3.85	*84.4*	5.0	2.9	*58*
82.4	14.73	1,240						3.4	3.67	*92.6*	5.1	2.65	*52*
85.2	15.40	1,470	11.2	6.6	14.0	*80*	*47.1*	3.27	3.75	*87.2*	4.65	2.6	*55.9*
86.8	15.20		11.8	7.2	[1] 13.2	*89.4*	*54.5*	3.42	3.67	*93.2*	5.0	2.5	*50*
86.4	14.80			7.2				3.25	3.65	*89*	5.0	2.7	*54*
85.2	14.73			6.8	13.6		*50*	3.27	3.8	*86.1*	5.15	2.65	*51.5*
81.3	14.73	1,310	11.9	7.3	13.3	*89.5*	*54.9*	3.13	3.7	*84.6*	5.05	2.9	*57.4*
80.5	14.87	1,350		7.6	13.3		*57.1*	3.65	3.9	*93.6*	5.6	2.8	*50*
85.2	15.40	1,520	11.3	7.0	13.6	*83.1*	*51.2*	3.4	3.8	*89.5*	5.2	2.85	*54.8*
85.8	15.10		11.1	7.1	[2] 13.0	*85.4*	*54.6*	3.65	3.78	*96.6*	5.3	2.6	*49.1*
(16)	(16)	(9)	(9)	(13)	(11)	*(9)*	*(11)*	(15)	(15)	*(15)*	(15)	(15)	*(15)*
	236.68	11,980	101.10	90.00	144.50			50.61	56.64		75.50	40.00	
83.7	*14.79*	*1,331*	*11.23*	*6.92*	*13.14*	*86*	*52.9*	*3.37*	*3.78*	*89.3*	*5.03*	*2.67*	*53*
76.5	14.10	1,200	10.80	6.30	12.00	*80*	*47.1*	3.13	3.65	*84.4*	4.65	2.30	*45.1*
91.5	15.40	1,520	11.90	7.60	14.00	*90*	*57.1*	3.65	3.95	*96.6*	5.60	2.90	*58*

[2] About.

Manhattan Island Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
20/3527	A. M. N. H.	North end of Manhattan Island.	Adult		19.1	13.1	13.1	*68.6*
226, 012	U. S. N. M.	Willets Point	do		19.2	13.4	13.4	*69.8*
99/6669	A. M. N. H.	Manhattan Island	do		19.0	13.4	14.0	*70.5*
20/3502	do	North end of Manhattan Island.	do		19.5	13.8	14.6	*70.8*
99/6667	do	Manhattan Island	do		19.1	13.9	14.6	*72.8*
20/3526	do	do	do		19.3	14.1	13.6	*73.1*
20/3528	do	do	do		19.9	14.6	14.3	*73.4*
20/3501	do	do	do		19.3	14.2	13.7	*73.6*
20/3500	do	do	do		19.2	14.2	13.5	*74*
20/3525	do	do	do		19.2	14.2	14.0	*74*
3, 521	do	do	do		18.7	14.1	13.9	*75.4*
Totals					(11)	(11)	(11)	*(11)*
Averages					211.50	153.00	152.70	------
Minima					*19.23*	*13.91*	*13.88*	*72.3*
Maxima					18.70	13.10	13.10	*68.6*
					19.90	14.60	14.60	*75.4*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
99/6673	A. M. N. H.	Cooper Street, Manhattan Island.	Adult		18.1	13.0	13.7	*71.8*

[1] Near.

Long Island Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
"E"	A. M. N. H.	Port Washington, Long Island.	Adult		19.3	13.0	13.8	*67.4*
"C"	do	do	do		19.2	13.1	------	*68.2*
"B"	do	do	do		18.9	13.2	14.5	*69.8*
99/4100	do	Shinnecock Hills, Long Island.	do		19.0	13.6	14.5	*71.6*
"A"	do	Port Washington, Long Island.	do		19.2	13.8	14.4	*71.9*
"D"	do	do	do		19.5	14.2	14.6	*72.8*
Totals					(6)	(6)	(5)	*(6)*
Averages					115.10	80.90	71.80	------
					19.18	*13.48*	*14.36*	*70.3*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
"G"	A. M. N. H.	Port Washington, Long Island.	Adult		18.2	12.6	12.8	*69.2*
"H"	do	do	do		18.2	13.3	13.3	*73.1*
"I"	do	do	do		18.5	13.9	13.3	*75.1*
"F"	do	do	do		17.5	13.5	12.9	*77.1*
Totals					(4)	(4)	(4)	*(4)*
Averages					72.40	53.30	52.30	------
					18.10	*13.32*	*13.07*	*73.6*

Manhattan Island Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
81.4	15.10										5.2	2.6	*50*
82.2	15.33	1,485	11.5		[1] 14.1	*81.6*					5.3	2.7	*50.9*
86.4	15.46			7.8	14.3		54.5	3.5	4.05	*86.4*	5.8	2.6	*44.8*
87.7	15.97			7.3	12.5		*58.4*	3.2	3.68	*87*	4.9	2.2	*44.9*
88.5	15.86			8.1				3.45	3.9	*88.5*	6.0	2.7	*45*
81.4	15.67		11.7	7.2	13.2	*88.6*	*54.6*	3.15	4.0	*78.8*	5.2	2.15	*41.3*
82.9	16.27												
81.8	15.73			7.3	12.8		*57*	3.12	3.92	*79.6*	4.95	2.3	*46.5*
80.8	15.63		11.4	6.7	13.0	*87.7*	*51.5*	3.13	3.78	*82.8*	5.05	2.35	*46.5*
83.8	15.80		12.4	7.1	12.4	*100*	*57.3*	3.12	4.07	*76.7*	5.0	2.2	*44*
84.8	15.57		12	7.2	13.2	*90.9*	*54.6*	3.15	3.87	*81.4*	5.2	2.5	*48.1*
(11)	(11)		(5)	(8)	(8)	(5)	(7)	(8)	(8)	(8)	(10)	(10)	*(10)*
	172.39		59.00	58.70	105.50			25.82	31.27		52.60	24.30	
83.8	*15.67*		*11.80*	*7.34*	*13.19*	*89.5*	*55.4*	*3.23*	*3.91*	*82.2*	*5.26*	*2.43*	*46.2*
80.8	15.10		11.40	6.70	12.40	*81.6*	*51.5*	3.12	3.68	*76.7*	4.90	2.15	*41.3*
88.5	16.27		12.40	8.10	14.30	*100*	*58.4*	3.50	4.07	*88.5*	6.00	2.70	*50.9*

FEMALE

88.1	14.93												

Long Island Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
85.4	15.37												
								3.5	4.15	*84.3*	5.1	2.2	*43.1*
90.3	15.53			7.1	13.5		*52.6*	3.2	3.9	*82.1*	5.25	2.25	*42.9*
89	15.70		12.0	6.9	13.1	*91.6*	*52.7*	3.15	3.65	*86.3*	4.8	2.5	*52.1*
87.3	15.80			7.5	14.3		*52.4*	3.3	4.15	*79.5*	5.2	2.75	*52.9*
86.6	16.10			8.4	14.5		*57.9*	3.25	4.07	*79.9*	6.1	2.65	*43.4*
(5)	(5)			(4)	(4)		(4)	(5)	(5)	(5)	(5)	(5)	(5)
	78.50			29.90	55.40			16.40	19.92		26.45	12.35	
87.7	*15.70*			*7.47*	*13.85*		*54*	*3.28*	*3.98*	*82.3*	*5.29*	*2.47*	*46.7*

FEMALE

83.1	14.53			7.2				3.1	3.6	*86.1*	4.7	2.3	*48.9*
84.4	14.93			6.6	12.5		*52.8*	2.87	3.6	*79.8*	4.5	2.35	*52.2*
82.1	15.23			6.9	13.3		*51.9*	3.47	3.9	*89*	5.1	2.35	*46.1*
83.2	14.63				12.8			3.45	3.9	*88.5*	5.1	2.45	*48*
(4)	(4)			(3)	(3)		(2)	(4)	(4)	(4)	(4)	(4)	(4)
	59.32			20.70	38.60			12.89	15.00		19.40	9.45	
83.2	*14.83*			*6.90*	*12.87*		*52.3*	*3.22*	*3.75*	*85.9*	*4.85*	*2.36*	*48.7*

Staten Island Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
20/4423	A. M. N. H.	Staten Island	Adult		20.0	14.0	15.3	*70*
20/3190	do	do	do		19.0	13.4	14.2	*70.5*
20/3246	do	Tottensville, Staten Island.	do		19.3	14.1	14.2	*73.1*
20/4471	do	Staten Island	do		19.6	14.4	14.9	*73.5*
20/3153	do	Tottensville, Staten Island.	do		17.6	14.4	14.2	*81.8*
20/3176	do	do	do		18.5	15.2	14.5	*82.3*
Totals					(6) 114.00	(6) 85.50	(6) 87.30	(6)
Averages					*19.00*	*14.25*	*14.55*	*75*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
20/3136	A. M. N. H.	Tottensville, Staten Island.	Adult		18.3	13.1	12.9	*71.6*
20/3149	do	do	do		17.9	13.8	13.2	*77.1*
224,898	U. S. N. M.	Staten Island	do		17.0	13.2	13.2	*77.6*
Totals					(3) 53.20	(3) 40.10	(3) 39.30	(3)
Averages					*17.73*	*13.37*	*13.10*	*75.4*

[1] Near.

New Jersey Indian crania: Delaware (or Lenape) [1]

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
19,514	P. M. C.	Gloucester County, N. J.	Adult		19	13	14.3	*68.4*
285,303	U. S. N. M.		50		18.9	13.3	14.2	*70.4*
1880	A. N. S. P.	Cape Henlopen	Adult		19	14	High.	*73.7*
285,308	U. S. N. M.		55		19.8	14.6	13.8	*73.7*
57,791	P. M. C.	Trenton	Adult		18.8	13.9	High.	*73.9*
57,788	do	do	do		19.2	14.2	High.	*74*
228	F. M. N. H.	New Jersey	do		17.9	13.4		*74.9*
285,306	U. S. N. M.		60		18.7	14	14	*74.9*
285,313	do		60		18.8	14.4	13.7	*76.6*
285,326	do		50		17.7	13.7	14.4	*77.4*
44,742	P. M. C.	Keyport	Adult		18.4	14.3	13.7	*77.7*
57,785	do	Trenton	do		17.6	13.9	13.7	*79*
Totals					(12) 223.80	(12) 166.70	(8) 111.80	(12)
Averages					*18.65*	*13.89*	*13.97*	*74.4*
Minima					17.6	13	13.7	*68.4*
Maxima					19.8	14.6	14.4	*79*

[1] Full report on this material has been published in Bulletin 62, Bu. Amer. Ethnology (Hrdlička, A., Physical Anthropology of the Lenape, etc.), Washington, 1916, 130 pp.

Staten Island Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
90	16.43	-------	-------	7.3	14.8	-------	*49.3*	3.6	4.02	*89.6*	4.95	2.8	*56.6*
87.6	15.53	-------	-------	7.6	14.0	-------	*54.3*	3.3	3.9	*84.6*	5.05	2.6	*51.5*
85	15.87	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
87.6	16.30	-------	-------	7.5	[1] 15.2	-------	*42.8*	3.55	4.0	*88.8*	5.25	2.7	*51.4*
88.8	15.42	-------	12.1	7.5	-------	-------	-------	3.5	3.95	*88.6*	5.1	2.25	*44.1*
86.1	16.07	-------	12.3	7.7	14.6	*84.2*	*52.7*	3.55	4.15	*85.5*	5.65	2.45	*43.4*
(6)	(6)	-------	(2)	(5)	(4)	-------	(4)	(5)	(5)	(5)	(5)	(5)	(5)
-------	95.62	-------	24.4	37.60	58.60	-------	-------	17.50	20.02	-------	26.00	12.80	-------
87.5	*15.94*	-------	*12.2*	*7.52*	*14.65*	-------	*51.4*	*3.50*	*4.00*	*87.4*	*5.20*	*2.56*	*49.2*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
79.6	14.76	-------	-------	6.5	12.6	-------	*51.6*	3.15	3.95	*79.7*	4.8	2.55	*53.1*
83.3	14.96	-------	-------	6.4	-------	-------	-------	3.3	4.0	*82.5*	4.75	2.65	*55.8*
87.4	14.47	1,310	-------	-------	12.7	-------	-------	3.12	3.57	*90.2*	4.7	2.55	*54.3*
(3)	(3)	-------	-------	(2)	(2)	-------	-------	(3)	(3)	(3)	(3)	(3)	(3)
-------	44.19	-------	-------	12.9	25.3	-------	-------	9.57	11.52	-------	14.25	7.75	-------
84.2	*14.73*	-------	-------	*6.45*	*12.65*	-------	-------	*3.19*	*3.84*	*83.1*	*4.75*	*2.58*	*54.4*

New Jersey Indian crania: Delaware (or Lenape)

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
89.4	15.43	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
88.2	15.47	1,515	11.8	6.8	13.7	*86.1*	*49.6*	3.4	3.9	*87.2*	5	2.2	*44*
80.2	16.07	1,720	12.6	7.4	14.2	*88.7*	*52.2*	3.4	3.95	*86.1*	5.3	2.8	*52.8*
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
-------	-------	[2] 1,415	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
85.6	15.57	1,505	12.2	7	13.9	*87.8*	*50.4*	3.35	3.75	*89.3*	5	2.9	*58*
82.5	15.63	1,550	12	7.2	14	*85.7*	*51.4*	3.2	4.1	*78.1*	5.15	3	*58.3*
91.7	15.27	1,470	12.1	6.9	13.6	*89*	*50.7*	3.3	3.6	*91.7*	5	2.35	*47*
83.8	15.46	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
87	15.06	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
(8)	(8)	(6)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
-------	123.96	9,175	60.70	35.30	69.40	-------	-------	16.65	19.30	-------	25.45	13.25	-------
86	*15.49*	*1,529*	*12.14*	*7.06*	*13.88*	*87.5*	*50.9*	*3.33*	*3.86*	*86.3*	*5.09*	*2.65*	*52.1*
80.2	15.06	1,415	11.8	6.8	13.6	*85.7*	*49.6*	3.2	3.6	*78.1*	5	2.2	*44*
91.7	16.07	1,720	12.6	7.4	14.2	*89*	*52.2*	3.4	4.1	*91.7*	5.3	3	*58.3*

[2] Near.

New Jersey Indian crania: Delaware (or Lenape)—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
(5)	A. M. N. H.	Trenton	Adult		18.3	12.1		*66.1*
(7)	do	do	do		18.1	12.4		*68.5*
57,790	P. M. C.	do	do		18.3	12.8	High.	*69.9*
19,512	do	Westchester, Pa.–Delaware Valley.	do		18.1	13	13.2	*71.8*
285,309	U. S. N. M.		45		18.2	13.3	13.1	*73.1*
(4)	A. M. N. H.	Trenton	do		17.6	12.9	12.8	*73.3*
57,797	P. M. C.	do	do		17	12.5	13.5	*73.5*
57,794	do	do	do		17.4	12.8		*73.6*
226	F. M. N. H.		do		17	12.6	12.9	*74.1*
285,327	U. S. N. M.		45		17.6	13.1	12.4	*74.4*
118	A. N. S. P.		Adult		17.8	13.5	13.6	*75.8*
1,264	do		do		17.4	13.3	13.3	*76.4*
285,307	U. S. N. M.		28		16.9	13	12.9	*76.9*
285,320	do		50		17.4	13.4	13	*77*
(6)	A. M. N. H.	Trenton	Adult		17	13.1	13	*77*
568	A. N. S. P.		do		17.2	13.3	13.3	*77.3*
40	do		do		17.8	13.8	12.9	*77.5*
1,265	do		do		17.4	13.6	13.2	*78.2*
(3)	A. M. N. H.		do		17.4	13.6	12.6	*78.2*
(1)	do		do		17.1	13.7		*80.1*
225	F. M. N. H.		do		17.2	13.9	12.5	*80.8*
227	do		do		17.2	13.9	13.4	*80.8*
					(22)	(22)	(17)	*(22)*
Totals					385.40	289.60	221.60	
Averages					*17.52*	*13.16*	*13.03*	*75.1*
Minima					16.90	12.1	12.4	*66.1*
Maxima					18.30	13.9	13.6	*80.8*

Pennsylvania Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
306,989	U. S. N. M.	Chester County	Adult		19.5	13.9	14.2	*71.3*
288,920	do	Northampton County.	35		19.2	14.6		*76*
111/28	C. I. P.	Blairsville, Pa.	Adult		17.7	14.8	14.3	*83.6*
					(3)	(3)	(2)	*(3)*
Totals					56.4	43.3	28.5	
Averages					*18.8*	*14.43*	*14.25*	*76.8*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
19,512	P. M. C.	West Chester, Chester County.	Adult		18	12.8	13	*71.1*
288,917	U. S. N. M.	Northampton County.	do		17	13.1	13.4	*77.1*
288,368	do	do	do		17.4	13.9	13.9	*79.9*
288,918	do	do	do		17.1	14.3	13.4	*83.6*
1/3828	C. I. P.	Blairsville, Pa.	do		16.6	14.1	12.8	*84.9*
					(5)	(5)	(5)	*(5)*
Totals					86.1	68.2	66.5	
Averages					*17.22*	*13.64*	*13.30*	*79.2*

New Jersey Indian crania: Delaware (or Lenape)—Continued

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
--------	--------	--------	--------	6.7	11.9	--------	*56.3*	3.4	3.7	*91.9*	4.9	2.4	*48.9*
84.9	14.77	--------	--------	7.2	--------	--------	--------	3.7	3.85	*96.1*	5.05	2.4	*47.5*
83.2	14.87	1,300	--------	--------	--------	--------	--------	3.3	3.65	*90.4*	4.9	2.6	*53.1*
83.9	14.43	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
91.5	14.33	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
87.2	14.17	1,280	--------	6.7	12	--------	*55.8*	3.3	4	*82.5*	4.5	2.55	*56.7*
80.8	14.37	1,225	11.2	6.6	12.4	*90.3*	*53.2*	3.38	3.58	*94.4*	4.8	2.6	*54.2*
86.9	14.97	--------	--------	7	--------	--------	--------	3.5	3.4	*87.5*	4.8	2.8	*58.3*
86.6	14.67	--------	--------	--------	12.7	--------	--------	3.55	3.7	*95.9*	4.9	2.6	*53.1*
86.3	14.27	1,240	--------	6.8	12.4	--------	*54.8*	3.48	3.85	*90.3*	4.8	2.7	*56.3*
84.4	14.60	1,280	--------	--------	--------	--------	--------	3.3	--------	--------	4.9	2.7	*55.1*
86.4	14.37	--------	--------	7	--------	--------	--------	3.45	3.8	*90.8*	5	2.5	*50*
87.2	14.60	--------	--------	6.7	12.8	--------	*52.3*	3.2	3.9	*82.1*	5	2.6	*52*
81.6	14.83	--------	--------	6.9	12.6	--------	*54.8*	3.2	3.7	*86.5*	4.8	2.55	*53.1*
85.2	14.73	--------	--------	--------	12.7	--------	--------	3.2	3.75	*85.3*	4.5	2.55	*56.7*
81.3	14.53	1,360	--------	6.3	12.8	--------	*49.2*	3.45	4	*86.2*	5	2.4	*48*
80.4	14.53	1,325	--------	7	13.2	--------	*53*	3.45	4.2	*82.1*	5.2	2.6	*50*
86.2	14.83	1,340	--------	6.9	13.7	--------	*50.4*	3.35	3.95	*84.8*	5.1	2.3	*45.1*
(17)	(17)	(8)	--------	(12)	(11)	--------	*(9)*	(16)	(15)	*(15)*	(16)	(16)	*(16)*
--------	247.87	10,350	--------	81.80	139.20	--------	--------	54.21	57.03	--------	78.15	40.85	--------
84.9	*14.58*	*1,294*	--------	*6.82*	*12.65*	--------	*53.2*	*3.39*	*3.8*	*89.3*	*4.88*	*2.55*	*52.3*
80.4	14.17	1,225	--------	6.3	11.9	--------	*49.2*	3.2	3.4	*82.1*	4.5	2.3	*45.1*
91.5	14.97	1,360	--------	7.2	13.7	--------	*56.3*	3.7	4.2	*96.1*	5.2	2.8	*58.3*

Pennsylvania Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
85	15.87	1,630	12.6	7.9	--------	--------	--------	3.5	4.05	*86.4*	5.7	2.9	*50.9*
88	15.60	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
(2)	(2)	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
--------	31.47	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
86.5	*15.73*	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

FEMALE

84.4	14.60	--------	--------	7.1	--------	--------	--------	3.65	3.78	*96.6*	5.1	2.4	*47.1*
89	14.50	1,220	10.4	6.4	12.4	*83.9*	*51.6*	3.2	3.5	*91.4*	5	2.45	*49*
88.8	15.07	1,350	11	6.8	13	*84.6*	*52.3*	3.18	3.75	*84.8*	4.85	2.45	*55.2*
85.4	14.93	--------	11.3	6.8	13.2	*85.6*	*51.5*	3.45	3.68	*93.8*	4.8	2.4	*50*
83.4	14.50	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
(5)	(5)	(2)	(3)	(4)	(3)	*(3)*	*(3)*	(4)	(4)	*(4)*	(4)	(4)	*(4)*
--------	73.60	2,570	32.7	27.1	38.6	--------	--------	13.48	14.71	--------	19.75	9.7	--------
86.2	*14.72*	*1,285*	*10.9*	*6.78*	*12.87*	*84.7*	*51.8*	*3.37*	*3.68*	*9.17*	*4.94*	*2.42*	*49.1*

Maryland Indian crania: Algonkin

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
253,154	U. S. N. M.	Piscataway Creek.	Adult		19.7	14.2		*72.1*
253,148	do	do	do		19.4	14.3		*73.7*
253,146	do	do	do		19	14.1	13.6	*74.2*
253,155	do	do	do		18.8	14		*74.5*
Totals					(4) 76.9	(4) 56.6		(4)
Averages					*19.22*	*14.15*		*73.6*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
228,367	U. S. N. M.	Sandy Hill, Cambridge, Md.	Adult		18.9	13.4		*70.9*
228,366	do	do	do		18.4	13.3	12.9	*72.3*
253,147	do	Piscataway Creek.	do		17.9	13.3		*74.3*
253,150	do	do	do		17.1	13.5		*78.9*
Totals					(4) 72.3	(4) 53.5		(4)
Averages					*18.08*	*13.38*		*74*

Virginia Indian crania: Algonkin (or related)

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
228,016	U. S. N. M.		50		19.3	13.7		*71*
14	V. M.		55		18.4	13.1		*71.2*
9	do		Adult		18.8	13.4		*71.3*
35	do		do		17.8	12.8	[1] 14	*71.9*
169,668	U. S. N. M.		45		19.2	13.9		*72.4*
19	V. M.		60		18.9	13.8	14.2	*73*
23	do		70		19	14	14.6	*73.7*
228,015	U. S. N. M.		Adult		18.3	13.5		*73.8*
22	V. M.		50		17.3	12.9	13.8	*74.6*
25	do		55		18.7	14	14.6	*74.9*
226,428	U. S. N. M.		55		19.5	14.6	14.7	*74.9*
32	V. M.		Adult		17.3	13	13.9	*75.1*
226,404	U. S. N. M.		40		18.2	13.7		*75.3*
33	V. M.		Adult		17.9	13.6	14.5	*76*
226,401	U. S. N. M.		60		18.5	14.1		*76.2*
226,395	do		65		18.3	14	14.3	*76.5*
228,013	do	Near Linville, Rockingham County.	40		18.7	14.3	13.6	*76.5*
31	V. M.		Adult		18.5	14.2		*76.8*
36	do		do		18.7	14.4	15	*77*
226,394	U. S. N. M.		45		18	13.9	14.4	*77.2*
228,006	do		50		18.6	14.4		*77.4*
228,007	do		55		18.4	14.3	13.9	*77.7*
288,012	do		45		18	14	13.6	*77.8*
24	V. M.		50		18.1	14.2	13.9	*78.4*
2	do		Adult		17.4	13.8	14	*79.3*
16	do		65		18.2	14.5	14.8	*79.7*

[1] Near.

Maryland Indian crania: Algonkin

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
82.2	15.57	1,430						3.48	3.98	*87.4*	5.4	2.7	*50*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
81.4	14.87	1,280											

Virginia Indian crania: Algonkin (or related)

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
					13.4								
[1] *91.5*	[1] 14.87		12.5	7.4				3.3	3.75	*88*	5.3	2.6	*49.1*
86.9	15.63							3.4	3.95	*86.1*			
84.8	15.86							3.6	3.9	*92.3*	5.6	2.9	*51.8*
91.4	14.66			[1] 7.3	12.6		[1] 57	3.1	3.65	*84.9*	5.1	2.7	*52.9*
89.3	15.76							3.4	3.75	*90.7*	5.5	2.75	*50*
86.2	16.27												
91.7	14.73												
			12.9	7.7	14.1	*91.5*	*54.6*	3.6	4	*90*	5.3	2.8	*52.8*
92.1	15.33			7.3	13.3		*54.9*	3.1	3.6	*86.1*	5.2	2.8	*53.8*
								3.5	4.1	*85.4*			
88.5	15.53							3.4	3.9	*87.2*			
82.4	15.53												
90.6	16.03				14.7								
90.3	15.43							3.45	3.8	*90.8*	5.5	2.6	*47.8*
85	15.53			7.3	15.3		*47.7*	3.7	4.15	*89.2*	5.4	2.8	*51.3*
85	15.20												
86.1	15.40							3.35	3.7	*90.5*	5.1	2.5	*49*
89.7	15.06			7.2				3.5	3.8	*92.1*	5.1		
90.5	15.83				15.1			3.45	4.05	*85.2*	5.25	2.8	*53.3*

Virginia Indian crania; Algonkin (or related)—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
148,325	U. S. N. M.		50		18.7	15		*80.2*
1	V. M.		Adult		18.1	14.6	14.4	*80.7*
228,002	U. S. N. M.		45		17.8	14.4	14.5	*80.9*
					(29)	(29)	(19)	*(29)*
Totals					532.60	404.10	270.70	
Averages					*18.36*	*13.93*	*14.25*	*75.9*
Minima					17.3	12.8	13.6	*71*
Maxima					19.5	15	15	*80.9*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
228,004	U. S. N. M.		Adult		18.6	13.2		*71*
15	V. M.		40		18.1	13		*71.8*
10	do		55		18.2	13.3	14	*73.1*
170,678	U. S. N. M.		40		18.2	13.4	13.5	*73.6*
29	V. M.		Adult		18.2	13.4		*73.6*
13	do		45		18.3	13.5		*73.8*
27	do		Adult		17.4	13	13.9	*74.7*
38	do		do		17.4	13		*74.7*
8	do		60		17.9	13.4		*74.9*
34	do		Adult		17.7	13.3		*75.1*
228,010	U. S. N. M.		55		17.3	13	13.1	*75.1*
12	V. M.		40		17.8	13.4		*75.3*
5	do		40		17.1	13.6	13.5	*75.9*
21	do		35		18.2	13.9	13.9	*76.4*
11	do		45		18	13.8	14	*76.7*
28	do		Adult		17.6	13.5		*76.7*
228,001	U. S. N. M.		40		18	13.8		*76.7*
3	V. M.		60		17.6	13.6	12.9	*76.8*
6	do		40		18.3	14.1	13.7	*77*
26	do		Adult		18	13.9	13.5	*77.2*
228,014	U. S. N. M.		do		16.6	13		*78.3*
172,469	do		70		17.6	13.8		*78.4*
7	V. M.		40		17.5	13.8	13.6	*78.9*
37	do		Adult		17.2	13.6	13.3	*79.1*
170,471	U. S. N. M.		do		17.9	14.2		*79.3*
30	V. M.		do		18	14.3	13.3	*79.4*
20	do		40		17.7	14.1	13.7	*79.7*
4	do		25		16.7	13.5	13.4	*80.8*
					(28)	(28)	(15)	*(28)*
Totals					497.10	379.40	203.30	
Averages					*17.75*	*13.55*	*13.55*	*76.3*
Minima					16.6	13	12.9	*71*
Maxima					18.6	14.3	14	*80.8*

Kentucky Indian crania (prewhite)

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
290,018	U. S. N. M.	Green River, Ohio County.	Adult		18.7	13.2	13.6	*70.6*
290,054	do	do	do		18	13		*72.2*
290,069	do	do	do		17.6	13	13.6	*73.9*
290,039	do	do	do		18.4	13.6	14.2	*73.9*
290,061	do	do	do		17.5	13	14.2	*74.3*
290,026	do	do	do		17.3	12.9	(13.4)	*74.6*
290,045	do	do	do		17.4	13		*74.7*
290,036	do	do	do		17.8	13.3	14	*74.7*

1 Left.

Virginia Indian crania; Algonkin (or related)—Continued

MALE—Continued

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
----	----	----	----	----	----	----	----	----	----	----	----	----	----
88.1	15.70	----	----	----	----	----	----	3.2	3.8	*84.2*	----	----	----
90.1	15.57	----	----	----	----	----	----	----	----	----	----	----	----
(19)	(19)	----	(2)	(6)	(7)		*(4)*	(15)	(15)	*(15)*	(11)	(10)	*(10)*
----	293.92	----	25.4	44.20	98.50	----	----	51.05	57.90	----	58.35	27.25	----
88.6	*15.47*	----	*12.7*	*7.37*	*14.07*		*52.3*	*3.4*	*3.86*	*88.2*	*5.3*	*2.72*	*51.2*
82.4	14.66	----	12.5	7.2	12.6	----	*47.7*	3.1	3.6	*84.2*	5.1	2.5	*47.3*
92.1	16.27	----	12.9	7.7	15.3	----	*57*	3.7	4.15	*92.8*	5.6	2.9	*53.8*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
----	----	----	----	----	----	----	----	3.2	3.85	*83.1*	5	2.6	*52*
----	----	----	----	----	----	----	----	----	----	----	----	----	----
88.9	15.16	----	----	----	----	----	----	----	----	----	----	----	----
85.4	15.03	----	----	6.1	----	----	----	3.3	3.75	*88*	----	----	----
----	----	----	----	----	----	----	----	----	----	----	----	----	----
91.4	14.76	----	----	----	----	----	----	----	----	----	----	----	----
----	----	----	----	----	----	----	----	----	----	----	----	----	----
----	----	----	----	----	----	----	----	----	----	----	----	----	----
86.5	14.46	----	----	----	----	----	----	----	----	----	----	----	----
87.9	14.73	----	----	6.6	13	----	*51.1*	3.2	3.63	*88.3*	4.5	2.65	*58.9*
86.6	15.33	----	11.4	7	12.8	*89.1*	*54.7*	3.3	3.7	*89.2*	5.05	2.9	*57.4*
88.1	15.26	----	----	----	----	----	----	----	----	----	----	----	----
----	----	----	----	----	----	----	----	----	----	----	----	----	----
82.7	14.70	----	----	----	12.9	----	----	3.58	3.85	*92.9*	5.4	2.75	*50.9*
84.5	15.33	----	----	7	13.4	----	*52.2*	3.3	3.55	*92.7*	5.05	2.7	*53.5*
84.6	15.13	----	----	----	----	----	----	----	----	----	----	----	----
----	----	----	----	----	----	----	----	----	----	----	----	----	----
86.9	14.96	----	----	----	----	----	----	----	----	----	----	----	----
86.4	14.70	----	----	----	----	----	----	----	----	----	----	----	----
82.4	15.20	----	----	----	----	----	----	----	----	----	----	----	----
86.2	15.16	----	11.7	7.1	13.3	*88*	*54.2*	3.4	3.8	*89.5*	5.2	2.8	*53.8*
88.7	14.53	----	----	6.8	13.3	----	*51.1*	3.12	3.77	*82.8*	4.8	2.5	*52.1*
(15)	(15)	----	(2)	(6)	(6)	*(2)*	*(5)*	(8)	(8)	(8)	(7)	(7)	(7)
----	221.44	----	23.1	40.60	78.70	----	----	26.40	29.90	----	35	18.90	----
86.4	*14.96*	----	*11.55*	*6.77*	*13.12*	*88.5*	*52.4*	*3.3*	*3.74*	*88.3*	*5*	*2.7*	*54*
82.4	14.46	----	11.4	6.1	12.8	*88*	51.1	3.12	3.55	*82.8*	4.5	2.5	*50.9*
91.4	15.33	----	11.7	7.1	13.4	*89.1*	54.7	3.58	3.85	*92.9*	5.4	2.9	*58.9*

Kentucky Indian crania (prewhite)

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
85.5	15.17	1,485	11.8	6.85	----	----	----	3.15	3.9	*80.8*	4.7	2.15	*45.7*
----	----	(1,390)	----	----	----	----	----	----	----	----	----	----	----
88.9	14.73	1,380	----	6.8	----	----	----	[1] 3.1	[1] 3.7	*83.8*	5	----	----
88.7	15.40	1,445	11.5	7.1	14.2	*81*	*50*	3.1	3.95	*78.5*	5.05	2.65	*52.5*
93.4	14.90	1,330	12.1	7.4	13.9	*87*	*53.2*	3.2	3.65	*87.7*	5.3	2.3	*43.4*
(88.7)	(14.53)	(1,295)	[2] 11	6.65	13.1	*84*	*50.8*	2.92	3.8	*76.8*	4.55	2.25	*49.4*
----	----	----	----	----	----	----	----	[1] 3.5	[1] 3.7	*94.6*	----	----	----
90.3	15.03	1,420	11.7	6.85	13.2	*88.6*	51.9	3.1	3.7	*83.8*	4.65	2.4	*51.6*

[2] Teeth badly diseased.

Kentucky Indian crania (prewhite)—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
290, 016	U. S. N. M.	Green River, Ohio County.	Adult		17.9	13.4	14.5	*74.9*
290, 041	do	do	do		18	13.5	13.6	*75*
290, 043	do	do	do		17.8	13.4	14.2	*75.3*
290, 042	do	do	do		18	13.6	13.6	*75.6*
290, 025	do	do	do		18.5	14	13.8	*75.7*
290, 055	do	do	do		17.3	13.1		*75.7*
290, 030	do	do	do	Slight asymmetry.	18.2	13.8		*75.8*
290, 021	do	do	do		17.6	13.4	13.6	*76.1*
290, 059	do	do	do		17.4	13.3	14	*76.4*
290, 035	do	do	do		18	13.8	14.1	*76.7*
290, 037	do	do	do		18	13.8	14.6	*76.7*
290, 020	do	do	do		17.8	13.7	14.3	*77*
290, 070	do	do	do		17.8	13.7	14.3	*77*
290, 073	do	do	do		17.2	13.3	14	*77.3*
290, 023	do	do	do		18	14	13.4	*77.8*
290, 017	do	do	do		17.4	13.6	13.7	*78.2*
290, 047	do	do	do		17.8	14	14.4	*78.6*
290, 040	do	do	do		17	13.4	13.9	*78.8*
290, 015	do	do	do		18	14.2	14.3	*78.9*
290, 067	do	do	do		18	14.2		*78.9*
290, 057	do	do	do		17.4	13.8	13.8	*79.3*
290, 038	do	do	do		17.6	14	13.8	*79.5*
290, 080	do	do	do		17	13.6	13.6	*80*
290, 029	do	do	do		16.9	13.6	13.4	*80.5*
290, 082	do	do	do		17	13.8		*81.2*
290, 062	do	do	do		17.8	14.6	14.2	*82*
					(34)	(34)	(27)	*(34)*
Totals					602	461.6	376.7	
Averages					*17.7*	*13.58*	*13.95*	*76.7*
Minima					16.9	12.9	13.4	*70.6*
Maxima					18.7	14.6	14.6	*82*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
290, 072	U. S. N. M.	Green River, Ohio County.	Adult		17.4	12.4	12.4	*71.3*
290, 049	do	do	Adolescent.		17.6	13	13.4	*73.9*
290, 071	do	do	Senile		17.6	13	13.6	*73.9*
290, 048	do	do	Adult		17.8	13.2	13	*74.2*
290, 022	do	do	do		17.3	12.9	13.7	*74.6*
290, 024	do	do	do		16.9	12.6	13.4	*74.6*
290, 050	do	do	do		17.2	13	12.9	*75.6*
290, 046	do	do	Adolescent.		17.2	13	13	*75.6*
290, 034	do	do	Adult		17.2	13		*75.6*
290, 064	do	do	do		17.6	13.4	13.2	*76.1*
290, 032	do	do	do		17.2	13.1	13.7	*76.2*
290, 068	do	do	do		17	13	13	*76.5*
290, 006	do	do	Near adult		17.2	13.2	12.9	*76.7*
290, 053	do	do	Adult		17.2	13.2	13	*76.7*
290, 033	do	do	do		17.5	13.5	13.4	*77.1*
290, 044	do	do	Adolescent.		16.85	13	12.4	*77.4*
290, 077	do	do	Near adult		16.8	13	12.8	*77.4*
290, 051	do	do	Adult		17.5	13.6	13.4	*77.7*
290, 063	do	do	do		17.1	13.3	13.4	*77.8*
290, 007	do	do	do		16.8	13.2	13.2	*78.6*
290, 027	do	do	Near adult		16.5	13	13.4	*78.8*
290, 019	do	do	Adult		16.2	12.8	13.1	*79*
290, 065	do	do	Near adult	Slight asymmetry.	16.3	13	13.2	*79.7*
290, 058	do	do	Adult		17	13.6	13	*80*
290, 060	do	do	Near adult		15.9	12.8	12.8	*80.5*
290, 028	do	do	Adult		15.9	13.2	12.6	*83*
					(26)	(26)	(25)	*(26)*
Totals					442.75	340	327.9	
Averages					*17.03*	*13.12*	*13.11*	*77*
Minima					15.9	12.4	12.4	*71.3*
Maxima					17.8	13.6	13.7	*83*

[1] Left. [2] Teeth badly diseased.

Kentucky Indian crania (prewhite)—Continued

MALE—Continued

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
92.9	15.27	-------	11.6	7.1	14	82.9	50.7	3.35	-------	-------	5.2	2.5	48.1
86.6	15.03	1,410	-------	7.5	13.8	-------	54.3	3.4	3.75	90.7	5.2	2.4	46.1
91	15.13	1,490	[2] 10.5	-------	13.3	78.9	-------	2.9	3.8	76.3	4.92	2.5	50.8
86.1	15.07	1,480	11.3	6.75	13.2	85.6	51.1	3.3	3.7	89.2	5.1	2.2	43.1
85.2	15.43	(1,650)	12.55	7.35	(13.8)	(90.9)	(53.3)	3.3	4	82.5	5.4	2.7	50
-------	-------	(1,360)	-------	6.7	(13.2)	-------	(50.8)	3.3	3.8	86.8	4.8	2.45	51
-------	-------	(1,480)	-------	-------	(13.7)	-------	-------	-------	-------	-------	-------	-------	-------
87.7	14.87	(1,260)	[2] 11.6	7.4	-------	-------	-------	3.1	3.8	81.6	5.4	2.55	47.2
91.5	14.90	1,315	12.8	7.8	13.8	92.7	56.5	3.6	-------	-------	5.65	2.4	42.5
88.7	15.30	1,515	11.1	6.6	-------	-------	-------	3.07	3.8	80.8	4.87	2.7	55.4
91.8	15.47	1,445	[2] 11.1	7.1	14.3	77.6	49.6	3.4	4	85	5.3	2.6	49.1
91.1	15.27	1,510	[2] 10.5	6.2	13.3	78.9	46.6	3.4	3.7	91.9	4.7	2.3	48.9
91.1	15.27	1,470	11.1	6.8	13.2	84.1	51.5	3.15	3.8	82.9	5.2	2.25	43.3
92.1	14.83	1,380	[2] 11	-------	12.9	85.3	-------	3.4	(3.65)	(93.2)	5	(2.1)	(42)
83.7	15.13	1,425	11	6.8	13.55	81.2	50.2	3.1	3.95	78.5	4.95	2.05	41.4
88.4	14.90	1,390	12.1	7.3	13.6	89	53.7	3.35	3.8	88.1	5.1	1.9	37.2
90.6	15.40	1,540	11.4	6.8	13.8	82.6	49.3	3.35	3.9	85.9	5.1	2.5	49
91.4	14.77	1,390	12.4	7.4	13.75	90.2	53.8	3.37	3.77	89.4	5.3	2.2	41.5
88.8	15.50	1,535	11.6	7.1	13.85	83.7	51.3	3.2	3.7	86.5	5.25	2.5	47.6
88.5	15.00	1,400	12.6	7.7	-------	-------	-------	3.45	3.65	94.5	5.25	2.3	43.8
87.3	15.13	1,440	11.8	7.25	13.4	88.1	54.1	3.2	3.85	83.1	5.2	2.3	44.2
88.9	14.73	1,375	-------	-------	-------	-------	-------	3.25	3.8	85.5	4.95	-------	-------
88.2	14.63	1,250	11.55	6.8	13.15	87.8	51.7	3.4	3.85	88.3	5	2.45	49
87.6	15.53	1,560	-------	-------	14.35	-------	-------	3.35	4.05	82.7	5.5	2.5	45.4
(27)	(27)	(24)	(24)	(25)	(21)	(19)	(18)	(30)	(27)	(27)	(29)	(26)	(26)
-------	407.79	34,380	277.7	176.1	285.65	-------	-------	97.76	102.87	-------	147.59	62	-------
89	15.10	1,432	11.57	7.04	13.6	84.7	51.7	3.26	3.81	84.9	5.09	2.38	46.8
83.7	14.63	1,250	10.5	6.2	12.9	77.6	46.6	2.9	3.65	76.3	4.55	1.9	37.2
93.4	15.53	1,560	12.8	7.8	14.35	92.7	56.5	3.6	4.05	94.6	5.65	2.7	55.4

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total*	*Facial Index, upper*	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
83.2	14.07	1,180	-------	-------	11.95	-------	-------	3.05	3.7	82.4	4.05	2.4	59.3
87.6	14.67	1,400	10.1	5.8	(11.6)	(87.1)	(50)	3.1	3.5	88.6	4.35	2.35	54
88.9	14.73	1,390	-------	-------	12.7	-------	-------	3.3	3.8	86.8	-------	(2.2)	-------
83.9	14.67	(1,270)	-------	-------	(12.7)	-------	-------	3.2	3.9	82	-------	-------	-------
90.7	14.63	-------	10.4	6.4	-------	-------	-------	3.3	3.7	89.2	(4.95)	2.1	-------
91.2	14.30	1,290	10.7	6.6	(12.9)	(82.9)	(51.2)	3.4	3.85	88.3	4.9	2.4	49
85.4	14.37	1,285	[3] 11	6.8	12.9	85.3	52.7	3.35	3.7	90.5	4.7	2.7	57.4
86.1	14.40	1,340	10.2	6	11.8	86.4	50.8	3.25	3.5	92.9	4.35	2.2	50.6
		(1,290)											
85.2	14.73	1,290	[2] 11.1	7	12.7	87.4	55.1	3.35	3.7	90.5	4.95	2.3	46.5
90.7	14.67	1,330	[2] 10.2	6.5	12.5	81.6	52	3.25	3.7	87.8	4.85	2.3	47.4
86.7	14.33	1,235	11.1	6.6	(11.9)	(93.3)	(55.5)	3.3	3.7	89.2	4.73	2.1	44.4
84.9	14.43	1,280	11	6.5	12.3	89.4	52.8	3.2	3.6	88.9	4.65	2.3	49.5
85.5	14.47	1,340	[3] 10.5	(6.3)	-------	-------	-------	3.1	[1] 3.7	83.8	4.5	2.25	50
86.4	14.80	1,430	10.7	6.4	(12.5)	(85.6)	(51.2)	3.35	3.7	90.5	4.6	2.25	48.9
83.2	14.08	1,230	(9.4)	5.5	(12.4)	(75.8)	(44.3)	[1] 3.2	[1] 3.4	94.1	4.3	2.2	51.2
85.9	14.20	1,260	10.6	6.3	12.2	86.9	51.6	3.35	3.65	91.8	4.7	2.1	44.7
86.4	14.83	1,260	[2] 10.5	(6.6)	13.1	80.1	(50.4)	3.3	3.7	89.2	4.9	2.4	49
88.2	14.60	1,250	10.7	6.6	12.85	83.3	51.4	3.15	3.7	85.1	4.7	2.55	54.2
88	14.40	1,220	[2] 9.6	6.2	(12.6)	(76.2)	(49.2)	3.2	3.55	90.2	4.6	2.25	48.9
91.2	14.30	1,300	-------	6.4	12.7	-------	50.4	3.2	3.75	85.3	4.65	2.1	45.2
90.3	14.03	-------	10.3	6.4	(12)	(85.8)	(53.3)	3.3	3.6	91.7	4.5	2.3	51.1
90.4	14.17	(1,205)	10.7	6.6	12.5	85.6	52.8	3.35	3.6	(93)	4.55	2.15	47.2
85	14.53	1,220	10.35	6.3	12.5	82.8	50.4	3.3	3.45	95.7	4.95	2.2	44.4
89.5	13.83	1,175	10.2	6.2	11.85	86.1	52.3	3.05	3.5	87.1	4.25	2	47.1
86.9	13.90	1,180	9.9	6.15	12.2	81.1	50.4	3.3	3.55	93	4.5	2.2	48.9
(25)	(25)	(21)	(20)	(20)	(15)	(12)	(12)	(25)	(25)	(25)	(22)	(23)	(22)
-------	360.14	26,885	209.85	127.25	186.75	-------	-------	81.2	91.2	-------	101.23	52.1	-------
87.2	14.41	1,280	10.49	6.36	12.45	84.6	51.9	3.25	3.65	89	4.6	2.26	49.4
83.2	13.83	1,175	9.6	5.5	11.8	80.1	50.4	3.05	3.4	82	5.05	2	44.4
91.2	14.83	1,430	11.1	7	13.1	89.4	55.1	3.4	3.9	95.7	4.95	2.7	59.3

[3] Teeth much worn.

Ohio (Ross County) Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
134,728	U. S. N. M.	Paint Creek	Adult		18.6	13.2	14	*71*
134,733	do	do	do		18.5	13.5	14.2	*73*
134,734	do	Ross County	do		18.8	13.8	15	*73.4*
					(3)	(3)	(3)	(3)
Totals					55.90	40.50	43.20	
Averages					*18.63*	*13.5*	*14.4*	*72.4*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
134,727	U. S. N. M.	Ross County	Adult		18.4	13	14.1	*70.6*

Ohio Indian crania: Miscellaneous Algonkin type

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,274	U. S. N. M.	Mercer County	Adult		18.5	14.1	14	*76.2*
243,276	do	Hamilton County	do		17.6	13.6		*77.3*
29,928	do	Mercer County	do		18	14		*77.8*
					(3)	(3)		(3)
Totals					54.1	41.7		
Averages					*18.03*	*13.9*		*77.1*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,272	U. S. N. M.	"Ohio"	Adult		17.3	13.3		*75.1*
243,887	do	do	do		17.6	13.5		*76.7*
226,006	do	Greene County	do		17.8	13.9	13.7	*78.1*
					(3)	(3)		(3)
Totals					52.7	40.7		
Averages					*17.57*	*13.57*		*77.2*

Ohio (Ross County) Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
88	15.27	1,480		8.1	(14.3)			3.5	4	*87.5*	6.1	2.7	*44.3*
88.8	15.40	1,505			13.9			3.4	3.95	*86.1*	5.4	2.6	*48.2*
92	15.87												
(*3*)	(3)	(2)						(2)	(2)	(*2*)	(2)	(2)	(*2*)
	46.54	2,985						6.9	7.95		11.5	5.3	
89.6	*15.51*	*1,492*						*3.45*	*3.97*	*86.8*	*5.75*	*2.65*	*46.1*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total*	*Facial Index, upper*	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
89.8	15.17		12	7.2	13.6	*88.2*	*52.9*	3.6	3.7	*97.3*	5.4	2.6	*48.2*

Ohio Indian crania: Miscellaneous Algonkin type

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
85.9	15.53	1,530											
		1,470	12.2	7.6	14.1	*86.5*	*53.9*	3.45	4	*86.2*	5.5	2.8	*50.9*
		(2)											
		3,000											
		1,500											

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total*	*Facial Index, upper*	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
86.4	15.13			6.6							4.8	2.25	*46.9*

Indiana Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma Height	*Cranial Index*
262,137	U. S. N. M.	Mouth of Wabash River.	Adult	Very slight asymmetry.	18.1	14	15.2	*77.4*
243,854	do	Pitchersville	do	Accessory bones deform lambd. suture.	18.1	14.5	14.1	*80.1*
243,853	do	Eugene	do		18.4	14.9	14.6	*81*
Totals					(3) 54.60	(3) 43.40	(3) 43.90	(3)
Averages					*18.2*	*14.47*	*14.63*	*79.5*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma Height	*Cranial Index*
243,844	U. S. N. M.	Lafayette	Adult		18	13.4	13	*74.4*
243,851	do	"Miami Indian," Indiana.	do		17.6	13.6	13	*77.3*
243,849	do	Brown's Mill	do				13.6	
Totals					(2) 35.60	(2) 27	(3) 39.60	(2)
Averages					*17.8*	*13.5*	*13.2*	*75.8*

[1] About. [2] Right.

Michigan Indian crania: Algonkin

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
289,680	U. S. N. M.	Lapeer County	Adult	Somewhat warped vault measurement, approximate.	19.2	13.2	13.8	*68.8*
197,419	do	do	do		18.1	13.0	13.7	*71.8*
289,681	do	do	do	Somewhat warped, measurement approximate.	18.2	13.4		*73.6*
243,635	do	Wayne County	do		18.3	13.7	13.2	*74.9*
243,631	do	do	do		18.2	13.7	13.6	*75.3*
49,401	do	Ogemaw County	do		18.4	13.9	13.9	*75.5*
243,632	do	Wayne County	do					
227,325	do	Mackinac Island	do		19.0		13.5	
Totals					(7) 129.4	(6) 80.9	(6) 81.7	(6)
Averages					*18.49*	*13.48*	*13.62*	*73.3*

Indiana Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
94.7	15.77	1,470	-------	7.6	14	-------	*54.3*	3.5	3.9	*89.7*	5.4	2.8	*51.8*
86.5	15.57	1,565	-------	6.65	[1] 13.6	-------	*48.9*	3.2	3.9	*82*	5.1	2.7	*52.9*
87.7	15.97	-------	-------	-------	-------	-------	-------	[2] 3.5	[2] 4	*87.5*	-------	-------	-------
(3)	(3)	(2)	-------	(2)	(2)	-------	(2)	(3)	(3)	(3)	(2)	(2)	(2)
-------	47.31	3,035	-------	14.25	27.6	-------	-------	10.2	11.8	-------	10.5	5.5	-------
89.6	*15.77*	*1,517*	-------	*7.12*	*13.8*	-------	*51.6*	*3.4*	*3.93*	*86.4*	*5.25*	*2.75*	*52.4*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
82.8	14.80	1,295	-------	7	-------	-------	-------	[3] 3.4	[3] 3.9	*87.2*	5	3.1	*62*
83.3	14.73	1,240	-------	-------	-------	-------	-------	[2] 3.25	[2] 3.8	*85.5*	5.1	2.7	*52.9*
-------	-------	-------	10.6	6.2	-------	-------	-------	3.65	[4] 3.8	*96*	4.65	2.4	*51.6*
(2)	(2)	(2)	-------	(2)	-------	-------	-------	(3)	(3)	(3)	(3)	(3)	(3)
-------	29.53	2,535	-------	13.2	-------	-------	-------	10.30	11.5	-------	14.75	8.2	-------
83.1	*14.76*	*1,267*	-------	*6.6*	-------	-------	-------	*3.43*	*3.83*	*89.6*	*4.92*	*2.73*	*55.6*

[3] Left. [4] Very near.

Michigan Indian crania: Algonkin

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
85.2	15.40	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
88.1	14.93	1,340	12.6	7.6	-------	-------	-------	3.31	3.89	*85.1*	5.5	2.45	*44.5*
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
82.5	15.07	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
85.3	15.17	1,410	-------	7.4	-------	-------	-------	3.6	3.86	*93.3*	5.5	2.7	*49.1*
86.1	15.40	1,510	12.5	7.5	14.1	*88.6*	*53.2*	3.35	3.9	*85.9*	5.5	2.6	*47.3*
-------	-------	-------	-------	7.4	-------	-------	-------	-------	-------	-------	5.6	2.9	*51.8*
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
(5)	(5)	(3)	(2)	(4)	-------	-------	-------	(3)	(3)	(3)	(4)	(4)	(4)
-------	75.97	4,260	25.1	29.9	-------	-------	-------	10.26	11.65	-------	22.1	10.65	-------
85.4	*15.19*	*1,420*	*12.55*	*7.5*	-------	-------	-------	*3.42*	*3.9*	*88.1*	*5.52*	*2.66*	*48.2*

Michigan Indian crania; Algonkin—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,633	U. S. N. M.	Wayne County	Adult		17.6	12.9	12.6	*73.3*
227,326	do	Mackinac Island	do		18.8	14.2	13.1	*75.5*
274,063	do	Genesee County	do		17.6	14.1	13.0	*80.1*
243,634	do	Wayne County	do		16.7	13.8		*82.6*
289,684	do	Lapeer County	do		17.0		12.9	
					(5)	(4)	(4)	(4)
Totals					87.7	55	51.6	
Averages					*17.54*	*13.75*	*12.9*	77.8

[1] About.

Illinois Indian crania: Miscellaneous Algonkin

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,881	U. S. N. M.	Jersey County	Adult		19.6	13.8	13.3	*70.4*
4,547	D. A. S.	Henry County	do		19.3	13.6	14.1	*70.5*
242,966	U. S. N. M.	Jersey County	Near senile.		19.1	13.6	14.0	*71.2*
227,450	do	Carroll County	Adult		18.1	13.0		*71.8*
225,067	do	Jersey County	do		18.0	13.1	14.2	*72.8*
243,026	do	do	do		18.6	13.6	14.8	*73.1*
4,535	D. A. S.	Rock Island County.	do		18.4	13.6	13.6	*73.9*
227,439	U. S. N. M.	Madison County	do		18.1	13.4		*74*
242,965	do	Jersey County	do		18.8	14.0		*74.5*
242,989	do	do	do		19.0	14.2	14.7	*74.7*
225,066	do	do	do		18.2	13.6	14.2	*74.7*
243,013	do	do	do		18.8	14.1	14.6	*75*
243,014	do	do	do		18.6	14.0		*75.3*
8,186	D. A. S.	Hancock County	do		18.2	13.7	14.2	*75.3*
243,025	U. S. N. M.	Jersey County	do		17.9	13.6	14.2	*76*
4,543	D. A. S.	Rock Island County.	do		18.6	14.2	14.2	*76.3*
136,775	U. S. N. M.	Schuyler County	do		17.8	13.6	14.6	*76.4*
227,435	do	Madison County	do		18.3	14.0	14.8	*76.5*
242,964	do	Jersey County	do		18.1	13.9	14.7	*76.8*
243,000	do	Union County	do		18.2	14.0		*76.9*
227,449	do	Jersey County	do		18.2	14.1	14.2	*77.5*
227,438	do	Madison County	do	Very slight asymmetry.	18.2	14.2		*78.0*
242,963	do	Jersey County	Near senile.		18.0	14.1	13.4	*78.3*
298,952	do	Fulton County	Adult		17.8	14.0	13.4	*78.6*
243,985	do	Jersey County	do		18.0	14.2	14.2	*78.9*
243,180	do	Randolph County	do		17.4	13.9	14.1	*79.9*
242,998	do	Jersey County	do		17.4	14.0		*80.5*
243,009	do	Madison County	do		18.0	14.5		*80.6*
243,022	do	Jersey County	do		18.2	14.8		*81.3*
225,272	do	Union County	do	Slight asymmetry.	18.1	14.8	15.0	*81.8*
					(30)	(30)	(21)	*(30)*
Totals					549	417.2	298.5	
Averages					*18.30*	*13.91*	*14.21*	*76*
Minima					17.4	13	13.3	*70.4*
Maxima					19.6	14.8	15	*81.8*

Michigan Indian crania; Algonkin—Continued

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
82.6	14.37	1,250	11.0	7.0	12.5	*88*	*56*	3.2	3.9	*82.0*	5.1	2.6	*51*
79.4	15.37	1,520											
82.0	14.90	1,450		6.7	[1]13.3		*50.4*	3.45	3.65	*94.5*	5.35	2.55	*47.7*
			10.6	6.2	13.3	*79.7*	*46.6*	3.37	3.8	*88.7*	5.1	[1]2.65	*52*
				6.2				[2]3.2	[2]3.9	*82.0*	4.9	2.5	*51.0*
(3)	(3)	(3)	(2)	(4)	(3)	*(2)*	*(3)*	(4)	(4)	*(4)*	(4)	(4)	*(4)*
	44.64	4,220	21.6	26.1	39.1			13.22	15.25		20.45	10.3	
81.3	*14.88*	*1,407*	*10.8*	*6.5*	*13*	*83.7*	*50.9*	*3.3*	*3.81*	*86.7*	*5.11*	*2.57*	*50.4*

[2] Right.

Illinois Indian crania: Miscellaneous Algonkin

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
79.6	15.57	1,450									5.2	2.6	*50*
85.7	15.67												
85.6	15.63	1,455			13.3			3.28	3.68	*89.1*	5.0	2.85	*57*
				6.8				3.22	3.96	*81.3*	5.0	2.85	*57*
91.3	15.10	1,450						3.53	3.88	*91*			
91.9	15.67	1,535	13.3	8.3	15.2	*87.5*	*54.6*	3.55	3.95	*89.9*	5.75	2.25	*39.1*
85	15.20										5.2	2.1	*40.4*
			12.3	7.5	13.4	*91.8*	*56*	3.7	4.0	*92.5*	5.4	2.5	*46.3*
			12.3	7.9				3.5	3.85	*90.9*	5.4	2.35	*43.5*
88.6	15.97	1,590		7.5	14.3		*52.4*	3.4	4.05	*84*	5.4	2.6	*48.2*
89.3	15.33	1,450		7.2								2.5	
88.8	15.83	1,605			14.5			3.5	4.1	*85.4*	5.7	2.5	*43.9*
			12.0	7.3	14.5	*82.8*	*50.3*	3.7	4.2	*88.1*	5.45	2.7	*49.5*
89.0	15.37										5.35	2.5	*46.7*
90.2	15.23	1,450		7.3	13.6		*53.7*	3.52	3.88	*90.7*	5.1	2.7	*52.9*
86.6	15.67										5.5	2.45	*44.5*
93	15.33	1,510		7.2	14.0		*51.4*	3.8	4.18	*90.9*	5.15	2.8	*54.4*
91.6	15.70		11.2	6.9				3.36	4.05	*83*	4.9	2.85	*58.2*
91.9	15.57	1,520	12.7	7.6	14.2	*89.4*	*53.5*	3.7	4.2	*88.1*	5.1	2.25	*44.1*
				7.4				3.45	3.8	*90.8*	5.1	3.0	*58.8*
87.9	15.50	1,600	12.6	7.9	13.6	*92.6*	*58.1*	3.6	4.0	*90*	5.6	2.5	*44.6*
				7.8				3.6	3.93	*91.6*	5.4	2.5	*46.3*
83.5	15.17	1,430			13.9			3.45	3.95	*87.3*	5.1	2.35	*46.1*
84.3	15.07	1,360											
88.2	15.47	1,520			13.9			3.25	3.8	*85.5*	5.3	2.65	*50*
90.1	15.13	1,360									5.6	2.5	*44.6*
				7.4	14.2		*52.1*	3.75	4.05	*92.6*	5.4	2.55	*47.2*
												2.4	
				7.7				3.55	4.05	*87.6*	5.8	2.65	*45.7*
91.2	15.97	1,700											
(21)	(21)	(16)	(7)	(16)	(13)	*(5)*	*(9)*	(20)	(20)	*(20)*	(24)	(26)	*(24)*
	325.15	23,985	86.4	119.7	182.6			70.41	79.56		127.9	66.45	
88.2	*15.48*	*1,499*	*12.34*	*7.48*	*14.05*	*88.7*	*53.5*	*3.52*	*3.98*	*88.5*	*5.33*	*2.55*	*48.1*
79.6	15.07	1,360	11.2	6.8	13.3	*82.8*	*50.3*	3.22	3.68	*81.3*	4.9	2.1	*39.1*
93	15.97	1,700	13.3	8.3	15.2	*92.6*	*58.1*	3.8	4.2	*92.6*	5.8	3	*58.8*

Illinois Indian crania; Miscellaneous Algonkin—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
58,410	U. S. N. M.	Naples, Ill.	Adult		17.8	13.1	13.9	*73.6*
242,997	do	Jersey County	do		17.3	12.9	13.4	*74.6*
134,778	do	Calhoun County	do		17.9	13.4	14.2	*74.9*
303,664	do	Madison County	do		17.4	13.2	13.4	*75.9*
136,777	do	Cass County	do		16.7	12.7	-------	*76*
243,011	do	Madison County	do		17.1	13.0	13.0	*76.0*
243,019	do	Calhoun County	do		17.6	13.4	13.1	*76.1*
227,444	do	Madison County	do		16.4	12.5	13.0	*76.2*
227,445	do	do	do		17.5	13.4	13.8	*76.6*
243,033	do	Alexander County	do		17.5	13.0	-------	*77.1*
303,666	do	Madison County	do		17.1	13.2	12.9	*77.2*
242,999	do	Kane County	do	Very slight asymmetry.	17.1	13.2	12.8	*77.2*
227,437	do	Madison County	do		16.4	12.7	13.0	*77.4*
4,546	D. A. S.	Henry County	do		17.3	13.4	-------	*77.5*
242,978	U. S. N. M.	Randolph County	do		17.1	13.3	13.9	*77.8*
7,802	D. A. S.	Rock Island County.	do		17.2	13.4	12.5	*77.9*
242,990	U. S. N. M.	Cheneys Grove, Ill.	do		17.8	13.9	13.1	*78.1*
242,983	do	Jersey County	do		17.0	13.3	14.2	*78.2*
60,281	do	Henderson County	do		17.4	13.6	13.6	*78.2*
242,972	do	Randolph County	do		17.6	13.8	14.0	*78.4*
4,544	D. A. S.	Henry County	do		17.4	13.7	13.8	*78.7*
242,996	U. S. N. M.	Jersey County	do		16.5	13.0	13.5	*78.8*
225,271	do	Union County	do		16.6	13.1	-------	*78.9*
227,448	do	Madison County	do		17.1	13.6	13.4	*79.5*
242,975	do	Randolph County	do		17.6	14.0	13.9	*79.6*
227,443	do	Madison County	do		17.4	13.9	-------	*79.9*
136,776	do	Cass County	do		17.6	14.1	12.9	*80.1*
242,980	do	Randolph County	do		17.2	13.8	13.9	*80.2*
227,442	do	Madison County	do		16.8	13.5	-------	*80.4*
243,003	do	Jersey County	do		16.2	13.1	13.3	*80.9*
301,993	do	Rock Island County.	do	Very slight asymmetry.	17.0	13.8	13.6	*81.2*
243,178	do	Randolph County	do		17.2	14.0	-------	*81.4*
243,001	do	Madison County	do	Very slight asymmetry.	16.2	13.2	-------	*81.5*
4,406	D. A. S.	Albany mounds	do		16.9	13.8	14.2	*81.7*
243,012	U. S. N. M.	Jersey County	do		17.0	13.9	14.0	*81.8*
242,969	do	Randolph County	do		17.4	14.3	-------	*82.2*
242,977	do	do	do		17.0	14.0	14.4	*82.4*
243,185	do	do	do		17.6	14.5	14.4	*82.4*
7,545	D. A. S.	Henry County	do		17.7	14.6	-------	*82.5*
					(39)	(39)	(29)	*(39)*
Totals					669.6	526.3	393.1	-------
Averages					*17.17*	*13.49*	*13.55*	*78.6*
Minima					16.2	12.5	12.5	*73.6*
Maxima					17.9	14.6	14.4	*82.5*

Illinois Indian crania; Miscellaneous Algonkin—Continued

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
90	14.93	-----	-----	-----	12.1	-----	-----	-----	-----	-----	-----	-----	-----
88.7	14.53	1,300	-----	-----	12.7	-----	-----	3.58	3.75	95.5	5.1	2.75	53.9
90.7	15.17	1,455	-----	-----	13.3	-----	-----	3.38	4.0	84.5	4.9	2.8	57.1
87.6	14.67	1,255	-----	6.5	12.3	-----	52.8	3.37	3.7	91.1	4.8	2.45	51.0
-----	-----	1,220	-----	6.6	12.3	-----	53.7	3.58	3.85	90.4	4.9	2.3	46.9
86.4	14.63	-----	-----	-----	12.4	-----	-----	3.6	3.8	94.7	5.1	2.5	49.0
84.5	14.70	1,390	11.7	-----	12.9	90.7	-----	3.65	3.83	95.3	5.2	2.4	46.2
90	13.97	1,110	-----	6.2	12.3	-----	50.4	3.38	3.52	96.0	4.4	2.55	58
89.3	14.90	1,280	-----	6.1	12.2	-----	50	3.08	3.65	84.4	4.55	2.7	59.3
			-----	7.4	12.9	-----	57.4	3.6	4.0	90	5.3	2.5	47.2
85.2	14.40	1,230	11.5	7.0	12.7	90.6	55.1	3.45	3.77	91.5	4.9	2.65	54.1
84.5	14.37	1,210	-----	-----	12.5	-----	-----	3.5	3.7	94.6	-----	2.35	-----
89.4	14.03	1,215	-----	6.3	11.8	-----	53.4	3.3	3.8	86.8	4.8	2.7	56.2
91.4	14.77	1,455	11.8	6.9	-----	-----	-----	-----	-----	-----	4.9	2.65	54.1
81.7	14.37	-----	-----	6.5	13.1	-----	49.6	-----	-----	-----	4.7	2.5	53.2
82.6	14.93	-----	-----	6.1	13.0	-----	46.9	3.25	3.7	87.8	4.6	2.75	59.8
93.7	14.83	-----	11.6	7.2	12.8	90.6	56.2	3.45	3.8	90.8	5.0	2.6	52
87.7	14.87	1,310	11.9	7.2	13.0	91.5	55.4	3.3	3.9	84.6	5.2	2.5	48.1
89.2	15.13	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	2.75	-----
88.7	14.97	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
91.5	14.33	1,220	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
87.3	14.70	1,350	11.4	7.0	12.9	88.4	54.3	3.46	3.85	89.9	4.9	2.45	50
88	15.17	1,430	-----	7.1	13.0	-----	54.6	3.2	3.7	86.5	4.9	2.45	50
				7.3	-----	-----	-----	3.72	4.0	93	5.2	2.7	51.9
81.4	14.87	1,330	-----	-----	13.0	-----	-----	3.07	3.65	84.1	-----	-----	-----
89.7	14.97	1,325	-----	-----	-----	-----	-----	-----	-----	-----	5.4	2.5	46.3
-----	-----	-----	11.8	7.3	12.6	93.6	57.9	3.5	3.8	92.1	5.4	2.6	48.2
90.8	14.20	1,130	-----	6.2	12.7	-----	48.8	3.45	3.6	95.8	4.6	2.4	52.2
88.3	14.80	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	1,400	-----	7.3	-----	-----	-----	-----	-----	-----	5.1	2.9	56.9
-----	-----	-----	-----	-----	12.8	-----	-----	-----	-----	-----	-----	-----	-----
92.5	14.97	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
90.6	14.97	1,350	-----	7.2	12.3	-----	58.5	3.27	3.85	84.9	5.15	2.7	52.4
											4.65	2.75	59.1
92.9	15.13	1,435	11.2	6.8	-----	-----	-----	3.45	3.85	89.6	4.9	2.7	55.1
89.7	15.50	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
(29)	(29)	(21)	(8)	(20)	(24)	(6)	(16)	(23)	(23)	(23)	(26)	(28)	(26)
-----	427.78	27,400	92.9	136.2	303.6	-----	-----	78.59	87.07	-----	128.55	72.55	-----
88.4	14.75	1,305	11.61	6.81	12.65	90.9	53.4	3.42	3.79	90.3	4.94	2.59	52.5
81.4	13.97	1,110	11.2	6.1	11.8	88.4	46.9	3.07	3.52	84.1	4.4	2.3	46.2
93.7	15.50	1,455	11.9	7.4	13.3	93.6	58.5	3.72	4	96	5.4	2.9	59.8

Wisconsin Indian crania: Algonkin

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
172,793	U. S. N. M.	Not given	Aged		18.7	13.9		*74.3*
115,432	do	Barron County	Adult		18.1	13.5	14	*74.6*
115,477	do	do	do		18.4	14.6	14.1	*79.4*
115,474	do	do	do					
243,290	do	Vernon County	do					
243,291	do	do	do					
Totals					(3) 55.2	(3) 42.0	(2) 28.1	(3)
Averages					*18.4*	*14*	*14.05*	*76.1*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
115,475	U. S. N. M.	Barron County	Adult		17.6	12.6	12.8	*71.6*
115,467	do	Crawford County	do		17.7	12.7	12.8	*71.8*
243,289	do	Vernon County	do		[1] 17.2	13		[1] *75.6*
115,465	do	Barron County	do	Slight asymmetry.	17.4	13.4	13.4	77
150,045	do	Outagamie County	do		17.6	13.8	13.5	*78.4*
243,283	do	Jefferson County	do					
243,285	do	do	do					
Totals					(5) 87.5	(5) 65.5	(4) 52.5	(5)
Averages					*17.5*	*13.1*	*13.1*	*74.9*

[1] Near.

Iowa (State) Indian crania [1]

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
6,781	D. A. S.	Scott County	Adult		18.6	13.8		*74.2*
3[illegible]5,102	U. S. N. M.	Council Bluffs	do		17.6	14.1	14.1	*80.1*
243,841	do	Near Davenport	Aged	Marked fronto-occipital.	(17.1)	(14)	(14.4)	(*81.9*)
243,842	do	do	Adult	do				
243,843	do	do	do	do				
Totals					(2) 36.2	(2) 27.9		(2)
Averages					*18.1*	*13.95*		*77.1*

[1] These specimens should not be taken, at least not without corroboration, for those of the Iowa tribe of which we have as yet no authentic skeletal remains; and the averages, in the uncertainty as to what tribes are represented in the above small series, have only a regional value.

Wisconsin Indian crania: Algonkin

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
------	------	------	------	------	------	------	------	------	------	------	------	------	------
88.6	15.20	------	------	------	------	------	------	------	------	------	------	------	------
85.4	15.70	1,575	------	------	------	------	------	3.45	4.25	*81.2*	5.5	2.9	*52.7*
------	------	------	------	7.3	------	------	------	3.57	4	*89.2*	5.8	2.5	*43.1*
------	------	------	------	7.5	------	------	------	------	------	------	5.8	3	*51.7*
------	------	------	------	7.7	------	------	------	------	------	------	5.7	------	------
(2)	(2)	------	------	(3)	------	------	------	(2)	(2)	(2)	(4)	(3)	(3)
------	30.90	------	------	22.5	------	------	------	7.02	8.25	------	22.8	8.4	------
87	*15.45*	------	------	*7.5*	------	------	------	*3.51*	*4.12*	*85.1*	*5.7*	*2.8*	*49.1*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
84.8	11.33	1,160	------	------	------	------	------	3.6	3.81	*94.7*	------	2.7	------
84.2	14.40	1,220	------	6.4	12.5	------	*51.2*	3.5	3.7	*94.6*	4.9	2.7	*55.1*
------	------	------	------	6.6	12.7	------	*52*	3.49	3.9	*89.7*	5.2	2.5	*48.1*
87	14.73	------	------	[1] 7.2	------	------	------	------	------	------	[1] 5	2.4	[1] *48*
86	14.97	1,420	------	------	------	------	------	------	------	------	------	------	------
------	------	------	------	6.6	------	------	------	3.4	3.8	*89.5*	5.3	2.55	*48.1*
------	------	------	------	6.7	------	------	------	3.2	3.9	*82.1*	4.9	2.35	*48*
(4)	(4)	(3)	------	(5)	(2)	------	(2)	(5)	(5)	(5)	(5)	(6)	(5)
------	58.43	3,800	------	33.5	25.2	------	------	17.19	19.11	------	25.3	15.2	------
85.5	*14.61*	*1,267*	------	*6.7*	*12.6*	------	*51.6*	*3.44*	*3.82*	*89.9*	*5.06*	*2.53*	*49.4*

Iowa (State) Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
------	------	------	------	------	------	------	------	------	------	------	------	------	------
89	15.27	------	------	7.1	13.7	------	*51.8*	3.25	4.03	*86.5*	5.2	2.7	*51.9*
(92.6)	15.17	1,520	------	------	(14.7)	------	------	3.7	4.05	*91.4*	5.6	2.6	*46.4*
------	------	------	12.3	7.6	------	------	------	3.6	3.7	*97.3*	5.7	2.6	*45.6*
------	------	------	11.1	------	------	------	------	3.65	4.1	*89*	5.2	2.6	*50*
------	(2)	------	(2)	(2)	------	------	------	(4)	(4)	(4)	(4)	(4)	(4)
------	30.44	------	23.4	14.7	------	------	------	14.2	15.88	------	21.7	10.5	------
------	*15.22*	------	*11.7*	*7.35*	------	------	------	*3.55*	*3.97*	*89.4*	*5.42*	*2.62*	*48.4*

Iowa (State) Indian crania—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
	D. A. S.	Near Davenport	Adult		17.6	13.2	13.3	*75*
1,004	do	Princeton, Iowa	do		17.2	13.8	12.7	*80.2*
305,101	U. S. N. M.	Council Bluffs	do	Moderate occipital flattening.	(16.5)		(13.6)	
225,295	do	Iowa	do		17.3			
227,369	do	Keokuk, Iowa	do					
Totals					(3) 52.1	(2) 27	(2) 26	(2)
Averages					*17.37*	*13.5*	*13*	*77.6*

Missouri (State) Indian crania: Miscellaneous

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
312,742	U. S. N. M.	Near Arlington, Mo.	Adult		18.9	13.4	13.8	*70.9*
218,993	do	Exact locality not known.	do	Very slight asymmetry.	18.9	14.0	14.4	*74.1*
312,744	do	Near Arlington, Mo.	do	do	18.6	13.8	13.9	*74.2*
89	G. Fowke	Boone County	do		18.6	13.8		*74.2*
312,743	U. S. N. M.	Near Arlington, Mo.	do		18.4	14.5	14.6	*78.8*
128	G. Fowke	Near Kansas City, Mo.	do		17.7	14.3	13.4	*80.8*
116	do	Near Easley, Boone County.	do					
27	do	Near Hartsburg, Boone County.	do					
124	do	Near Easley, Boone County.	do				14.4	
310,734	U S. N. M.	Millers Cave, Big Piney, Mo.	do					
Totals					(6) 111.1	(6) 83.8	(6) 84.5	(6)
Averages					*18.52*	*13.97*	*14.1*	*75.4*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
310,722	U. S. N. M.	Millers Cave, Big Piney Mo.	Adult		16.9	12.4	13.6	*73.4*
312,717	do	Bells Cave, Pulaski County.	do		17.3	13.2	13.7	*76.3*
310,732	do	Millers Cave, Pulaski County.	do		16.8	13.0	13.4	*77.4*
173,996	do	Mississippi County.	do	Slight asymmetry.	17.4	13.6	13.8	*78.2*
243,878	do	Near St. Louis	do		17.2	13.5	14.2	*78.5*
173,999	do	Mississippi County.	do	Slight occipital compression.	(16.8)	(13.5)	(14.6)	*(80.4)*
218,994	do	Exact locality unknown.	do	Slight asymmetry.	16.7	13.8	14.1	*82.6*
173,998	do	Mississippi County.	do	Marked fronto-occipital compression.				
218,995	do	Exact locality unknown.	do		17.6			
Totals					(7) 119.9	(6) 79.5	(6) 82.8	(6)
Averages					*17.13*	*13.25*	*13.8*	*77.7*

Iowa (State) Indian crania—Continued

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
86.4	14.70										5.2	2.55	49
81.9	14.57										5.05	2.5	49.5
				7.1				3.45	3.9	88.5	5.1	2.7	52.9
			11.9	7				3.5	3.8	92.1	4.9	2.4	49
			10.4	6.6				3.8	4	95	5	2.7	54
(2)	(2)		(2)	(3)				(3)	(3)	(3)	(5)	(5)	(5)
	29.27		22.3	20.7				10.75	11.7		25.25	12.85	
84.2	14.64		11.15	6.9				3.6	3.9	91.9	5.05	2.57	50.9

Missouri (State) Indian crania: Miscellaneous

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
85.4	15.37		11.7	7.6				3.35	4.05	82.7	5.3	2.6	49.1
87.5	15.77	1,550						3.6	4.1	87.8			
85.8	15.43	1,555		7.2	13.9		51.8	3.4	3.9	87.2	5.4	2.4	44.4
88.8	15.83	1,570	12.9	7.8	14.4	89.6	54.2	3.45	3.85	89.9	5.4	2.55	47.2
83.7	15.13												
			12.3	7.3							5.3	2.7	50.9
			12.7	7.65							5.25	2.45	46.7
											4.7	2.3	48.9
				6.8							4.95	2.45	49.5
(5)	(5)	(3)	(4)	(6)	(2)		(2)	(4)	(4)	(4)	(7)	(7)	(7)
	77.53	4,675	49.6	44.35	28.3			13.8	15.9		36.3	17.45	
86.3	15.51	1,558	12.4	7.4	14.15		53	3.45	3.98	86.8	5.2	2.5	48.1

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total*	*Facial Index, upper*	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
92.8	14.30	1,240	12.3	7.5	12.4	99.2	60.5	3.48	3.8	91.6	5.2	2.7	51.9
89.8	14.73	1,320	10.7	6.7	12.8	83.6	52.3	3.4	3.85	88.3	4.85	2.4	49.5
89.9	14.40	1,295		7.0	12.7		55.1	3.6	3.9	92.3	5.35	2.25	42.1
89.0	14.93	1,355											
92.5	14.97	1,310		6.2				3.3	3.7	89.2	4.9	2.7	55.1
(96.4)	14.97	1,240		7.1							4.9	2.6	53.1
92.5	14.87	1,370		7.2	13.3		54.1				5.4	2.5	46.3
				6.8				3.4	3.75	90.7	4.7	2.25	47.9
				7.5				3.7	4.05	91.4	5.3	2.9	54.7
(6)	(7)	(7)	(2)	(8)	(4)	(2)	(4)	(6)	(6)	(6)	(8)	(8)	(8)
	103.17	9,130	23	56.0	51.2			20.88	23.05		40.6	20.3	
91.1	14.74	1,304	11.5	7	12.8	91.3	55.5	3.48	3.84	90.6	5.08	2.54	50

Montana Indian crania: Algonkin-like

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243, 641	U. S. N. M.	Tongue River	Adult		18.8	14	13.4	*75.3*
243, 998	do	Montana	do		18.7	14.2	13.8	*75.9*
243, 660	do	Fort Shaw	do		17.5	14.2	13.9	*81.1*
					(3)	(3)	(3)	(3)
Totals					54.8	42.4	41.1	
Averages					*18.3*	*14.1*	*13.7*	*77.4*

Cheyenne Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243, 554	U. S. N. M.	Fort Zarah, Kans.	Adult		18.8	13.5	12.8	*71.8*
243, 547	do	do	do		18.9	14.0	13.2	*74.1*
243, 593	do	Sand Creek, Colo.	do		18.4	13.8	13.0	*75*
225, 146	do	Kansas	Senile		19.0	14.4	12.4	*75.8*
225, 091	do	Sand Creek, Colo.	Adult		19.3	14.8	14.0	*76.7*
243, 727	do	Fort Supply, Wyo.	do		18.1	13.9	13.3	*76.8*
243, 552	do	Salina River, Kans.	do		18.6	14.4	13.9	*77.4*
243, 548	do	Fort Zarah, Kans.	do		18.1	14.3	13.6	*79*
243, 549	do	Kansas	do		17.1	13.6	13.4	*79.5*
225, 251	do	Nebraska	do		18.8	15.0	13.8	*79.8*
243, 733	do	Wyoming	do		18.6	14.9	13.4	*80.1*
243, 550	do	Salina River, Kans.	do		18.2	14.6	13.8	*80.2*
243, 553	do	Fort Zarah, Kans.	do		17.6	14.5	12.8	*82.4*
243, 551	do	Salina River, Kans.	do		17.7	14.6	13.8	*82.5*
					(14)	(14)	(14)	(14)
Totals					257.20	200.30	187.20	
Averages					*18.37*	*14.31*	*13.37*	*77.9*
Minima					17.10	13.50	12.40	*71.8*
Maxima					19.30	15.00	14.00	*82.5*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243, 730	U. S. N. M.	Fort Laramie, Wyo.	Adult		17.2	13.6	12.7	*79.1*
243, 729	do	Wyoming	do		16.8	13.4	12.8	*79.8*
243, 728	do	do	do		17.3	14.4	12.4	*83.2*
					(3)	(3)	(3)	(3)
Totals					51.30	41.40	37.90	
Averages					*17.10*	*13.80*	*12.63*	*80.7*

[1] Very near.

Montana Indian crania: Algonkin-like

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
82.2	15.33	1,480	11	6.9	14	*78.6*	*49.3*	3.72	3.95	*94.2*	5.6	2.65	*47.3*
83.9	15.57	1,510	-------	7.3	13.4	-------	*54.5*	3.35	3.78	*88.6*	5.3	2.7	*50.9*
87.2	15.20	1,490	-------	7.4	14.2	-------	*52.1*	3.6	3.9	*92.3*	5.4	2.7	*50*
(*3*)	(3)	(3)	-------	(3)	(3)	-------	(*3*)	(3)	(3)	(*3*)	(3)	(3)	(*3*)
-------	46.10	4,480	-------	21.6	41.6	-------	-------	10.67	11.63	-------	16.3	8.05	-------
84.6	*15.37*	*1,493*	-------	*7.2*	*13.9*	-------	*51.9*	*3.56*	*3.88*	*91.8*	*5.4*	*2.7*	*49.4*

Cheyenne Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
79.3	15.03	1,400	-------	6.8	13.4	-------	*50.8*	3.40	3.95	*86.1*	5.0	2.6	*52*
80.2	15.37	1,570	12.6	7.8	13.9	*90.6*	*56.1*	3.75	3.95	*94.9*	5.6	2.5	*44.6*
80.8	15.07	1,475	11.7	7.5	13.5	*86.7*	*55.6*	3.55	4.05	*87.6*	5.5	2.7	*49.1*
74.2	15.27	1,385	-------	-------	13.7	-------	-------	-------	-------	-------	[1] 5.3	2.7	*50.9*
82.1	16.03	1,610	-------	7.2	14.9	-------	*48.3*	3.40	4.20	*81*	5.5	2.8	*50.9*
83.1	15.10	1.410	11.7	7.6	14.3	*81.8*	*53.1*	3.40	3.75	*90.2*	5.5	2.6	*47.3*
84.2	15.63	1,555	12.1	7.5	14.9	*81.2*	*50.3*	3.60	4.00	*90*	5.6	2.6	*46.4*
84	15.33	1,585	12.1	7.6	14.6	*82.9*	*52.1*	3.65	4.00	*91.2*	5.7	2.9	*50.9*
87.3	14.70	1,345	[2] 11.9	6.9	13.9	*85.6*	*49.6*	-------	-------	-------	4.9	2.4	*49*
81.7	15.87	1,680	-------	-------	14.9	-------	-------	3.60	3.90	*92.3*	5.2	2.7	*51.9*
80	15.63	1,670	11.1	7.0	15.3	*72.6*	*45.8*	3.70	4.15	*89.2*	5.35	2.7	*50.5*
84.2	15.53	1,620	11.9	7.2	14.0	*85*	*51.4*	3.45	3.85	*89.6*	5.4	2.6	*48.2*
79.8	14.97	1,510	12.1	7.6	14.5	*83.4*	*52.4*	3.70	4.10	*90.2*	5.8	2.9	*50*
85.4	15.37	1,535	11.6	6.6	14.1	*82.3*	*46.8*	3.20	3.75	*85.4*	4.95	2.5	*50.5*
(*14*)	(14)	(14)	(10)	(12)	(14)	(*10*)	(*12*)	(12)	(12)	(*12*)	(14)	(14)	(*14*)
-------	214.90	21,350	118.80	87.30	199.90	-------	-------	42.40	47.65	-------	75.30	37.20	-------
81.8	*15.35*	*1,525*	*11.88*	*7.27*	*14.28*	*89.3*	*51*	*3.53*	*3.97*	*89*	*5.38*	*2.66*	*49.4*
74.2	14.70	1,345	11.10	6.60	13.40	*72.6*	*45.8*	3.20	3.75	*81*	4.90	2.40	*44.6*
87.3	16.03	1,680	12.60	7.80	15.30	*90.6*	*56.1*	3.75	4.20	*94.9*	5.80	2.90	*52*

FEMALE

82.5	14.50	1,310	11.2	7.1	13.2	*84.8*	*53.8*	3.6	3.8	*94.7*	5.2	2.5	*48.1*
84.8	14.33	1,220	10.2	6.5	12.6	*81*	*51.6*	3.3	3.5	*94.3*	4.6	2.2	*47.8*
78.2	14.70	1,280	11.0	6.8	13.4	*82.1*	*50.8*	3.45	3.8	*90.8*	5.0	2.8	*56*
(*3*)	(3)	(3)	(3)	(3)	(3)	(*3*)	(*3*)	(3)	(3)	(*3*)	(3)	(3)	(*3*)
-------	43.53	3,810	32.40	20.40	39.20	-------	-------	10.35	11.10	-------	14.80	7.50	-------
81.8	*14.51*	*1,270*	*10.80*	*6.80*	*13.07*	*82.6*	*52*	*3.45*	*3.70*	*93.2*	*4.93*	*2.50*	*50.7*

[2] Very slightly worn.

Chippewa Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,349	U. S. N. M.	From Fort Pembina, N. Dak.	Adult		18.8	14.0	13.7	*74.5*
243,628	do	Near Lake Superior, Mich.	do		17.8	13.5	13.4	*75.8*
243,636	do	Fort Brady, Mich.	do	Somewhat warped and damaged.	18.8	14.8	14.9	*78.7*
243,640	do	Michigan	do		18.7	14.9	13.3	*79.7*
243,630	do	Near Lake Superior, Mich.	do		18.7	15.1	12.6	*80.8*
225,145	do	do	do		18.6	15.1	13.0	*81.2*
243,625	do	do	do	Damaged	[1] 18.4	15.2	13.0	*82.6*
243,639	do	Fort Alexander, Mich.	do		18.6	15.4	13.1	*82.8*
243,627	do	Near Lake Superior, Mich.	do		17.5	14.7	13.3	*84*
243,629	do	do	do		17.6	15.0	13.4	*85.2*
					(10)	(10)	(10)	*(10)*
Totals					183.5	147.7	133.7	
Averages					*18.35*	*14.77*	*13.37*	*80.5*
Minima					17.5	13.5	12.6	*74.5*
Maxima					18.8	15.4	14.9	*85.2*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,997	U. S. N. M.	Canada, near Lake Superior.	Adult		18.4	13.8	12.4	*75*
227,487	do	Fort Brady, Mich.	do		17.2	13.9	12.4	*80.8*
225,084	do		do		16.5	13.8	12.4	*83.6*
243,626	do	Michigan, near Lake Superior.	do		16.6	14.0	12.4	*84.3*
					(4)	(4)	(4)	*(4)*
Totals					68.7	55.5	49.6	
Averages					*17.18*	*13.88*	*12.4*	*80.8*

[1] Near.

Chippewa Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
83.5	15.50	1,480	-------	7.1	14.1	-------	*50.4*	3.3	3.8	*86.8*	5.4	2.6	*48.2*
85.6	14.90	-------	-------	6.8	13.3	-------	*51.1*	3.6	3.95	*91.2*	5.1	2.45	*48.0*
88.7	16.17	1,660	11.3	6.6	[1] 14.1	*80.1*	*46.8*	3.45	3.9	*88.5*	4.85	2.5	*51.6*
79.2	15.63	1,590	12.2	7.4	14.7	*83*	*50.4*	3.42	4.0	*85.5*	5.4	2.7	*50*
74.6	15.47	1,580	-------	6.8	-------	-------	-------	-------	-------	-------	5.2	2.5	*48.1*
77.1	15.57	1,610	11.5	6.7	[1] 14.4	*79.9*	46.5	3.48	4.1	*84.9*	5.2	2.8	*53.8*
77.4	15.53	1,590	-------	7.1	-------	-------	-------	-------	-------	-------	5.55	2.7	*48.6*
77.1	15.70	1,510	12.1	-------	15.1	*80.1*	-------	3.6	4.15	*86.8*	5.4	2.9	*53.7*
82.6	15.17	1,520	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
82.2	15.33	1,460	-------	7.3	13.8	-------	*52.9*	3.4	4.0	*85*	5.3	2.4	*45.3*
(*10*)	(10)	(9)	(4)	(8)	(7)	(*4*)	(*6*)	(7)	(7)	(*7*)	(9)	(9)	(*9*)
-------	154.97	14,000	47.1	55.8	99.2	-------	-------	24.25	27.9	-------	47.4	23.55	-------
80.7	*15.50*	*1,556*	*11.8*	*6.98*	*14.2*	*80.8*	*49.8*	*3.46*	*3.99*	*86.9*	*5.27*	*2.62*	*49.7*
74.6	14.90	1,460	11,3	6.6	13.3	*79.9*	*46.5*	3.3	3.8	*84.9*	4.85	2.4	*45.3*
88.7	16.17	1,660	12.2	7.4	15.1	*83*	*52.9*	3.6	4.15	*91.2*	5.55	2.9	*53.8*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total*	*Facial Index, upper*	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
77.0	14.87	1,400	-------	6.5	13.2	-------	*49.2*	3.21	3.81	*84.3*	4.7	2.6	*55.3*
79.7	14.50	1,360	11.6	6.9	-------	-------	-------	-------	-------	-------	4.9	2.7	*55.1*
81.8	14.23	1,120	10.7	6.5	13.4	*79.8*	*48.5*	3.2	3.85	*83.1*	4.75	2.6	*54.7*
81.0	14.33	1,240	-------	6.7	-------	-------	-------	3.43	3.85	*89.1*	4.6	2.6	*56.5*
(*4*)	(4)	(4)	(2)	(4)	(2)	-------	(*2*)	(3)	(3)	(*3*)	(4)	(4)	(*4*)
-------	57.93	5,120	22.3	26.6	26.6	-------	-------	9.84	11.51	-------	18.95	10.5	-------
79.9	*14.48*	*1,280*	*11.15*	*6.65*	*13.3*	-------	*48.9*	*3.28*	*3.84*	*85.5*	*4.74*	*2.62*	*55.4*

Algonkin and related crania: Summary of measurements

MALE

	Huron	Maine	Massachusetts	Rhode Island	Connecticut	Iroquois	New York State	Manhattan Island	Long Island	Staten Island
Number of skulls	(15)	(6)	(14)	(6)	(4)	(33)	(19)	(11)	(6)	(6)
Vault:										
Length	18.80	19.07	18.93	18.43	18.45	18.86	18.92	19.23	19.18	19
Breadth	13.87	13.87	13.78	13.58	13.50	13.77	14.02	13.91	13.48	14.25
Height	13.75	13.70	13.94	13.65	13.90	13.89	13.85	13.88	14.36	14.55
Cranial Index	*73.8*	*72.7*	*72.8*	*73.7*	*73.2*	*73*	*74.1*	*72.3*	*70.3*	*75*
Mean Height Index	*84.1*	*83.2*	*85.3*	*85.3*	*87*	*85.2*	*84.2*	*83.8*	*87.7*	*87.5*
Module	15.47	15.54	15.56	15.22	15.55	15.49	15.59	15.67	15.70	15.94
Capacity	------	------	1,507	------	------	------	1,530	------	------	------
Face:										
M.-N. Height	------	------	12.73	------	------	11.95	12.12	11.8	------	12.2
Alv. Pt.-N. Height	7.75	7.4	7.4	7.37	------	7.48	7.29	7.34	7.47	7.52
Breadth	14.13	13.45	13.71	13.33	13.75	13.84	14.1	13.19	13.85	14.65
Facial Index, total	------	------	*92.8*	------	------	------	*85.6*	*89.5*	------	------
Facial Index, upper	*54.2*	*55*	*54*	*55.3*	------	*54.1*	*51.2*	*55.4*	*54*	*51.4*
Orbits:										
Mean height	3.5	3.37	3.42	3.50	3.24	3.39	3.43	3.23	3.28	3.5
Mean breadth	3.97	3.90	3.96	3.88	3.81	3.90	3.91	3.91	3.98	4
Mean Index	*88.2*	*86.4*	*86.4*	*90.2*	*85*	*86.9*	*87.7*	*82.2*	*82.3*	*87.4*
Nose:										
Height	5.53	5.07	5.17	5.03	5	5.35	5.19	5.26	5.29	5.2
Breadth	2.63	2.31	2.57	2.64	2.45	2.74	2.71	2.43	2.47	2.56
Index	*47.5*	*45.6*	*49.7*	*52.5*	*49*	*51.2*	*52.2*	*46.2*	*46.7*	*49.2*

FEMALE

	Huron	Maine	Massachusetts	Rhode Island	Connecticut	Iroquois	New York State	Long Island	Staten Island	Delaware (Lenape)
Number of skulls	(9)	(6)	(26)	(6)	(4)	(24)	(18)	(4)	(3)	(22)
Vault:										
Length	17.64	18.08	17.70	17.62	17.85	17.87	17.72	18.1	17.73	17.52
Breadth	13.55	13.52	13.22	13.48	13.32	13.27	13.50	13.32	13.37	13.16
Height	13.36	13.22	13.33	13.50	13.30	13.30	13.09	13.07	13.1	13.03
Cranial Index	*77*	*74.8*	*74.7*	*76.5*	*74.6*	*74.3*	*76.2*	*73.6*	*75.4*	*75.1*
Mean Height Index	*85.7*	*83.7*	*86.2*	*86.8*	*85.4*	*85.4*	*83.7*	*83.2*	*84.2*	*84.9*
Module	14.85	14.92	14.72	14.81	14.85	14.81	14.79	14.83	14.73	14.58
Capacity	1,349	------	1,338	------	1,295	------	1,331	------	------	1,294
Face:										
M.-N. Height	------	11.63	11.43	11.5	------	11.2	11.23	------	------	------
Alv. Pt.-N. Height	6.97	6.82	7	6.96	6.85	6.96	6.92	6.90	6.45	6.82
Breadth	12.9	12.95	12.68	12.92	12.3	12.91	13.14	12.87	12.65	12.65
Facial Index, total	------	*89.8*	*89.9*	*89*	------	*91.1*	*86*	------	------	------
Facial Index, upper	*52.7*	*52.7*	*55.2*	*53.9*	*55.7*	*53.9*	*52.9*	*52.3*	------	*53.2*
Orbits:										
Mean height	3.41	3.28	3.35	3.46	3.32	3.34	3.37	3.22	3.19	3.39
Mean Breadth	3.81	3.80	3.79	3.82	3.6	3.77	3.78	3.75	3.84	3.8
Mean Index	*90.1*	*86.3*	*88.4*	*90.6*	*92.2*	*91.2*	*89.3*	*85.9*	*83.1*	*89.3*
Nose:										
Height	5.11	4.9	4.96	5.03	4.75	4.97	5.03	4.85	4.75	4.88
Breadth	2.69	2.45	2.46	2.67	2.6	2.59	2.67	2.36	2.58	2.55
Index	*52.7*	*50*	*49.6*	*53.1*	*54.7*	*52.1*	*53*	*48.7*	*54.4*	*52.3*

Algonkin and related crania: Summary of measurements

MALE

Delaware (Lenape)	Pennsylvania	Maryland	Virginia	Kentucky	Ohio, Ross County	Ohio, miscellaneous	Indiana	Michigan	Illinois	Wisconsin	Iowa	Missouri	Montana	Cheyenne	Chippewa
(12)	(3)	(4)	(29)	(34)	(3)	(3)	(3)	(7)	(30)	(3)	(4)	(6)	(3)	(14)	(10)
18.65	18.8	19.22	18.36	17.70	18.63	18.03	18.2	18.49	18.3	18.4	18.1	18.52	18.3	18.37	18.35
13.89	14.43	14.15	13.93	13.58	13.5	13.9	14.47	13.48	13.91	14	13.95	13.97	14.1	14.31	14.77
13.97	14.25	------	14.25	13.95	14.4	------	14.63	13.62	14.21	14.05	------	14.1	13.7	13.37	13.37
74.4	*76.8*	*73.6*	*75.9*	*76.7*	*72.4*	*77.1*	*79.5*	*73.3*	*76*	*76.1*	*77.1*	*75.4*	*77.4*	*77.9*	*80.5*
86	*86.5*	------	*88.6*	*89*	*89.6*	------	*89.6*	*85.4*	*88.2*	*87*	------	*86.3*	*84.6*	*81.8*	*80.7*
15.49	15.73	------	15.47	15.10	15.51	------	15.77	15.19	15.48	15.45	15.22	15.51	15.37	15.35	15.50
1,529	------	------	------	1,432	1,492	1,500	1,517	1,420	1,499	------	------	1,558	1,493	1,525	1,556
12.14	------	------	12.7	11.57	------	------	------	12.55	12.34	------	11.7	12.4	------	11.88	11.8
7.06	------	------	7.37	7.04	------	------	7.12	7.5	7.48	7.5	7.35	7.4	7.2	7.27	6.98
13.88	------	------	14.07	13.60	------	------	13.8	------	14.05	------	------	14.15	13.9	14.28	14.2
87.5	------	------	------	*84.7*	------	------	------	------	*88.7*	------	------	------	------	*89.3*	*80.8*
50.9	------	------	*52.3*	*51.7*	------	------	*51.6*	------	*53.5*	------	------	*53*	*51.9*	*51*	*49.8*
3.33	------	------	3.4	3.26	3.45	------	3.4	3.42	3.52	3.51	3.55	3.45	3.56	3.53	3.46
3.86	------	------	3.86	3.81	3.97	------	3.93	3.9	3.98	4.12	3.97	3.98	3.88	3.97	3.99
86.3	------	------	*88.2*	*84.9*	*86.8*	------	*86.4*	*88.1*	*88.5*	*85.1*	*89.4*	*86.8*	*91.8*	*89*	*86.9*
5.09	------	------	5.3	5.09	5.75	------	5.25	5.52	5.33	5.7	5.42	5.2	5.4	5.38	5.27
2.65	------	------	2.72	2.38	2.65	------	2.75	2.66	2.55	2.8	2.62	2.5	2.7	2.66	2.62
52.1	------	------	*51.2*	*46.8*	*46.1*	------	*52.4*	*48.2*	*48.1*	*49.1*	*48.4*	*48.1*	*49.4*	*49.4*	*49.7*

FEMALE

Pennsylvania	Maryland	Virginia	Kentucky	Ohio, miscellaneous	Indiana	Michigan	Illinois	Wisconsin	Iowa	Missouri	Cheyenne	Chippewa
(5)	(4)	(28)	(26)	(3)	(2)	(5)	(39)	(5)	(5)	(8)	(3)	(4)
17.22	18.08	17.75	17.03	17.57	17.8	17.54	17.17	17.5	17.37	17.13	17.1	17.18
13.64	13.38	13.55	13.08	13.57	13.5	13.75	13.49	13.1	13.5	13.25	13.8	13.88
13.30	------	13.55	13.12	------	13.2	12.9	13.55	13.1	13	13.8	12.63	12.4
79.2	*74*	*76.3*	*77*	*77.2*	*75.8*	*77.8*	*78.6*	*74.9*	*77.6*	*77.7*	*80.7*	*80.8*
86.2	------	*86.4*	*87.2*	------	*83.1*	*81.3*	*88.4*	*85.5*	*84.2*	*91.1*	*81.8*	*79.9*
14.72	------	14.96	14.41	------	14.76	14.88	14.75	14.61	14.64	14.74	14.51	14.48
1,285	------	------	1,280	------	1,267	1,407	1,305	1,267	------	1,304	1,270	1,280
10.9	------	11.55	10.49	------	------	10.8	11.61	------	11.15	11.5	10.8	11.15
6.78	------	6.77	6.36	------	6.6	6.5	6.81	6.7	6.9	7	6.8	6.65
12.87	------	13.12	12.45	------	------	13	12.65	12.6	------	12.8	13.07	13.3
84.7	------	*88.5*	*84.6*	------	------	*83.7*	*90.9*	------	------	*91.3*	*82.6*	------
51.8	------	*52.4*	*51.9*	------	------	*50.9*	*53.4*	*51.6*	------	*55.5*	*52*	*48.9*
3.37	------	3.3	3.25	------	3.43	3.3	3.42	3.44	3.6	3.48	3.45	3.28
3.68	------	3.74	3.65	------	3.83	3.81	3.79	3.82	3.9	3.84	3.7	3.84
91.7	------	*88.3*	*89*	------	*89.6*	*86.7*	*90.3*	*89.9*	*91.9*	*90.6*	*93.2*	*85.5*
4.94	------	5	4.6	------	4.92	5.11	4.94	5.06	5.05	5.08	4.93	4.74
2.42	------	2.7	2.26	------	2.73	2.57	2.59	2.53	2.57	2.54	2.5	2.62
49.1	------	*54*	*49.4*	------	*55.6*	*50.4*	*52.5*	*49.4*	*50.9*	*50*	*50.7*	*55.4*

NOTES ON THE ALGONKIN AND RELATED TRIBES

1. The extensive Algonkin strain shows almost throughout a clear and distinct physical character.

2. The type coincides closely with the extension of the linguistic family to which it belongs.

3. The Iroquois, notwithstanding the fact that they belong to a different linguistic stock and include some heterogeneous admixture from the south, are radically of the same physical type with the Algonkins and can not be separated from the latter.

4. The Algonkin type is characterized by:

    Dolicho- to meso-cephaly;
    High vault;
    Medium to large face;
    Medium to low orbits;
    Medium to relatively somewhat narrow nose.

5. In the Atlantic States as one proceeds southward the type, without interruption and without alteration in its characteristically high vault, shows a rising cephalic index, without, however, reaching higher than mesocephaly.

6. A similar condition as to the cephalic index is observed among some of the Algonkin tribes west of the Alleghanies, reaching its climax in the Chippewa.

7. The Chippewa are somewhat aberrant from the rest of the Algonkins in that their skull is somewhat broader and lower.

SIOUAN

Miscellaneous Sioux Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,257	U. S. N. M.	St. Josephs, N. Dak.	Adult		20.0	14.1	13.7	*70.5*
243,797	do	Fort Robinson, Nebr.	do		19.2	13.9	13.2	*72.4*
243,239	do	Fort Rice, N. Dak.	do		19.2	14.0	13.3	*72.9*
	D. A. S.	"Davenport captive."	do		19.2	14.2	13.2	*74.0*
317,399	U. S. N. M.	Minnehaha County, S. Dak.	do		19.4	14.4	13.6	*74.2*
243,344	do	Ft. Phil Kearney, Dak.	do		18.8	14.0	13.0	*74.5*
317,406	do	Minnehaha County, S. Dak.	do		18.3	13.8		*75.4*
243,715	do	Powder River, Wyo.	do		19.2	14.6	12.8	*76.0*
243,825	do	Summit Springs, Colo.	do		18.8	14.4	13.2	*76.6*
317,407	do	Minnehaha County, S. Dak.	do		19.1	14.7	13.4	*77.0*
	D. A. S.	"Davenport captive."	do		18.5	14.3	13.0	*77.3*
225,222	U. S. N. M.	Fort Sisseton, S. Dak.	do		17.8	14.0	12.7	*78.7*
243,724	do	Fort Laramie, Wyo.	do		18.1	14.4	12.5	*79.6*
243,259	do	Prairie Dog Creek, Kans.	do		18.7	14.9	13.1	*79.7*
243,725	do	Fort Fred Steele, Wyo.	do		17.8	14.2	12.6	*79.8*
	D. A. S.	"Davenport captive."	do		18.4	14.7	13.0	*79.9*
243,663	U. S. N. M.	Upper Missouri River.	do		18.2	15.2	13.0	*83.5*
					(17)	(17)	(16)	(17)
Total					318.7	243.80	209.3	
Averages					*18.75*	*14.75*	*13.08*	*76.5*
Minima					17.8	13.8	12.5	*70.5*
Maxima					20	15.2	13.7	*83.5*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,714	U. S. N. M.	Powder River, Wyo.	Adult		18.6	13.6	12.4	*73.1*
243,240	do	Fort Rice, N. Dak.	do		18.5	13.6	12.4	*73.5*
243,342	do	Heart River, N. Dak.	do		18.0	13.5	12.6	*75*
243,716	do	State of Wyoming.	do		17.7	13.4	12.8	*75.7*
201,016	do	do	do		18.1	13.8	13.2	*76.2*
225,242	do	Fort Robinson, Nebr.	do		17.4	13.3	12.8	*76.4*
243,738	do	Yellowstone region, North Dakota.	do		18.2	13.9	12	*76.4*
	D. A. S.	"Davenport captive."	do		17.9	13.7	13.1	*76.5*
225,219	U. S. N. M.	Nebraska	do		18.4	14.2	13.1	*77.2*
243,253	do	Fort Rice, N. Dak.	do		17.3	13.4	12.2	*77.5*
243,912	do	Fort Stevenson, N. Dak.	do		17.9	13.9	12.3	*77.7*
243,347	do	do	do		17.2	13.6	12.2	*79.1*
243,346	do	Heart River, N. Dak.	do		17.7	14.0	12.2	*79.1*
243,252	do	Fort Rice, N. Dak.	do		17.4	14.1	13.0	*81*
					(14)	(14)	(14)	(14)
Totals					250.3	192.0	176.3	
Averages					*17.88*	*13.71*	*12.59*	*76.7*
Minima					17.2	13.3	12	*73.1*
Maxima					18.6	14.2	13.2	*81*

SIOUAN

Miscellaneous Sioux Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
80.4	15.93	1,520	-------	7.6	14.2	-------	53.5	3.65	3.98	91.8	5.25	3.0	57.1
79.8	15.43	1,510	-------	7.9	14.6	-------	54.1	3.95	4.05	97.5	5.85	2.9	49.6
80.1	15.50	1,500	13.4	8.4	14.0	95.7	60	3.85	3.98	96.9	5.85	2.7	46.2
79.0	15.53	-------	-------	8.05	14.5	-------	55.5	-------	-------	-------	5.8	2.85	49.1
80.5	15.80	-------	-------	7.0	-------	-------	-------	-------	-------	-------	5.4	2.5	46.3
79.3	15.27	1,490	-------	7.4	14.3	-------	51.8	3.65	3.9	93.6	5.4	2.8	51.8
-------	-------	-------	12.1	7.5	-------	-------	-------	3.4	3.7	91.9	5.55	2.6	46.8
80.5	15.53	1,590	-------	7.5	14.1	-------	53.2	3.65	4.05	90.1	5.4	2.5	46.3
79.5	15.47	1,515	13.6	8.6	14.5	93.8	59.3	3.95	4.15	95.2	5.9	2.9	49.2
79.3	15.73	-------	-------	-------	14.1	-------	-------	-------	-------	-------	-------	-------	-------
79.3	15.27	-------	-------	-------	14.4	-------	-------	-------	-------	-------	5.0	2.55	51.0
79.9	14.83	1,380	12.5	7.6	13.7	91.2	55.5	3.4	4.0	85	5.5	2.4	43.6
76.9	15.00	1,465	12.6	7.4	15.2	82.9	48.7	3.45	4.02	85.7	5.4	2.95	54.6
78.0	15.57	1,400	12.2	7.8	14.5	84.1	53.8	3.9	3.9	100.0	5.5	2.3	41.8
78.7	14.87	1,405	12.7	8.0	14.2	89.4	56.3	3.68	4.1	89.6	5.55	2.75	49.6
78.6	15.37	-------	-------	7.5	14.2	-------	52.8	-------	-------	-------	5.35	2.4	44.9
77.8	15.47	1,620	-------	7.3	14.7	-------	49.7	-------	-------	-------	5.7	-------	-------
(16)	(16)	(11)	(7)	(15)	(15)	(6)	(13)	(11)	(11)	(11)	(16)	(15)	(15)
-------	246.57	16,395	89.1	115.55	215.2	-------	-------	40.53	43.83	-------	88.4	40.1	-------
78.9	15.41	1,490	12.73	7.70	14.35	89.4	54.1	3.68	3.98	92.4	5.52	2.67	48.5
76.9	14.83	1,380	12.1	7	13.7	82.9	48.7	3.4	3.7	85	5	2.3	41.8
80.5	15.93	1,620	13.6	8.6	15.2	95.7	60	3.95	4.15	100	5.9	3	57.1

FEMALE

77	14.87	1,400	-------	7.1	13.1	-------	54.2	3.7	3.92	94.4	5.4	2.9	53.7
77.3	14.83	1,300	-------	7.3	13.0	-------	56.1	3.55	3.75	94.7	5.4	2.8	51.8
80	14.70	1,380	-------	6.4	13.4	-------	47.8	3.3	3.85	85.7	4.7	2.3	48.9
82.3	14.63	1,285	-------	6.7	13.9	-------	48.2	3.4	4.05	83.9	4.9	2.6	53.1
82.8	15.03	1,340	11.8	7.6	13.7	86.1	55.5	3.82	3.9	98.1	5.4	2.45	45.4
83.4	14.50	1,270	11.5	7.0	13.6	84.6	51.5	3.62	3.95	91.8	5.15	2.2	42.7
74.8	14.70	1,360	-------	7.6	13.9	-------	54.7	3.6	3.9	92.3	5.5	2.6	47.3
82.9	14.90	-------	-------	7.2	13.2	-------	54.6	-------	-------	-------	5.6	2.5	44.6
80.4	15.23	1,380	11.5	7.5	13.6	84.6	55.2	3.8	3.88	98.1	5.5	2.4	43.6
79.5	14.30	1,290	-------	6.9	13.1	-------	52.7	3.5	3.85	90.9	4.95	2.45	49.5
77.4	14.70	1,310	-------	6.5	13.0	-------	50	3.55	3.9	91	-------	-------	-------
79.2	14.33	1,385	11.6	7.4	12.3	94.3	60.2	3.7	3.75	98.7	5.4	2.5	46.3
77	14.63	1,270	-------	7.0	13.3	-------	52.6	3.72	3.68	101.1	5.25	2.5	47.6
82.5	14.83	1,370	10.6	6.9	13.4	79.1	51.5	3.4	4.08	83.3	5.0	2.7	54
(14)	(14)	(13)	(5)	(14)	(14)	(5)	(14)	(13)	(13)	(13)	(13)	(13)	(13)
-------	206.18	17,340	57.0	99.1	186.5	-------	-------	46.66	50.46	-------	68.15	32.9	-------
79.7	14.73	1,334	11.40	7.08	13.32	85.6	53.1	3.59	3.88	92.4	5.24	2.53	48.5
74.8	14.30	1,270	10.6	6.4	12.3	79.1	47.8	3.3	3.68	83.3	4.7	2.2	42.7
83.4	15.23	1,400	11.8	7.6	13.9	94.3	60.2	3.82	4.08	101.1	5.6	2.9	54

Teton Sioux Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,341	U. S. N. M.	Fort Sully, S. Dak.	Adult		18.9	13.8	13.0	*73*
225,063	do	Fort Randall, S. Dak.	do		19.5	14.9	12.8	*76.4*
243,340	do	Fort Sully, S. Dak.	do		17.9	14.4	12.4	*80.5*
243,664	do	Milk River, Mont.	do		17.6	14.3	12.8	*81.3*
					(4)	(4)	(4)	(4)
Totals					73.9	57.4	51.0	
Averages					*18.48*	*14.35*	*12.75*	77.7

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
291,274	U. S. N. M.	Fort Yates, N. Dak.	Adult		18.4	13.6	12.7	*73.9*
291,085	do	do	do		17.6	14.0	13.4	*79.5*
280,000	do	do	do		17.7	14.2	12.0	*80.2*
					(3)	(3)	(3)	(3)
Totals					53.7	41.8	38.1	
Averages					17.9	13.93	12.7	*77.8*

Brulé Sioux Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
225,216	U. S. N. M.	Bordeaux Creek, Nebr.	Very near adult.		18.2	13.4	12.4	*73.6*
225,228	do	do	Adult		18.8	14.05	13.4	*74.7*
225,238	do	Camp Sheridan, Nebr.	do		19.6	14.7	13.4	*75*
225,268	do	do	do		19.1	14.4	12.9	*75.4*
225,246	do	Spotted tail reservation, Nebr.	do		18.1	13.7	13.1	*75.7*
243,702	do	Near Camp Sheridan, Nebr.	do		18.2	13.9	13.6	*76.4*
225,259	do	do	do		18.4	14.2	12.9	*77.2*
225,239	do	do	Senile or near.	Base somewhat impressed.	19.5	15.1	(11.6)	*77.4*
243,703	do	do	Adult		18.6	14.4	13.4	*77.4*
243,707	do	do	do		18.6	14.4	13.4	*77.4*
243,709	do	do	do		18.4	14.3	13.0	*77.7*
225,220	do	Bordeaux, Creek, Nebr.	do		18.6	14.7	12.7	*79*
243,701	do	do	do		18.4	14.9	13.5	*81*
243,378	do	Fort Randall, S. Dak.	Near senile.		17.8	15.1	12.2	*84.8*
225,245	do	Near Camp Sheridan, Nebr.	Adult		17.9	15.2	13.0	*84.9*
					(15)	(15)	(14)	*(15)*
Totals					278.2	216.45	182.9	
Averages					*18.55*	*14.43*	*13.06*	77.8
Minima					17.8	13.4	12.2	*73.6*
Maxima					19.6	15.2	13.6	*84.9*

Teton Sioux Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
79.5	15.23	1,480	-------	7.1	14.4	--------	*49.3*	3.65	3.82	*95.4*	5.3	2.85	*53.8*
74.4	15.73	1,640	-------	7.2	15.3	--------	*47.1*	3.6	4.3	*83.7*	5.35	2.5	*46.7*
76.8	14.90	1,435	-------	7.6	13.9	--------	*54.7*	3.95	4.2	*94.0*	5.55	2.9	*52.2*
80.2	14.90	1,370	-------	6.9	14.5	--------	*47.6*	3.5	3.95	*88.6*	------	------	-------
(4)	(4)	(4)	-------	(4)	(4)	--------	*(4)*	(4)	(4)	--------	(3)	(3)	*(3)*
--------	60.76	5,925	-------	28.8	58.1	--------	-------	14.7	16.27	--------	16.2	8.25	-------
77.7	*15.19*	*1,481*	-------	*7.2*	*14.52*	--------	*49.6*	*3.68*	*4.07*	*90.3*	*5.4*	*2.75*	*50.9*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
79.4	14.90	1,325	11.5	7.5	13.8	*83.3*	*54.3*	3.65	3.9	*93.6*	5.45	2.65	*48.6*
84.8	15.00	1,480	-------	7.0	12.8	--------	*54.7*	3.5	3.85	*90.9*	4.65	2.55	*54.8*
75.2	14.63	1,475	11.5	6.9	12.4	*92.7*	*55.7*	3.75	3.9	*96.1*	5.1	2.3	*45.1*
(3)	(3)	(3)	(2)	(3)	(3)	*(2)*	*(3)*	(3)	(3)	*(3)*	(3)	(3)	*(3)*
--------	44.53	4,280	23.0	21.4	39.0	--------	-------	10.90	11.65	--------	15.20	7.50	-------
79.8	*14.84*	*1,427*	*11.5*	*7.13*	*13.0*	*88*	*54.9*	*3.63*	*3.88*	*93.6*	*5.07*	*2.50*	*49.4*

Brulé Sioux Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
78.5	14.67	1,350	12.0	7.3	13.5	*88.9*	*54.1*	3.52	3.9	*90.4*	5.7	2.8	*49.1*
81.7	15.42	1,650	12.0	7.0	13.8	*87*	*50.7*	3.4	3.82	*88.9*	5.25	2.45	*46.7*
78.1	15.90	1,545	12.8	7.7	15.2	*84.2*	*50.7*	3.48	4.02	*86.3*	5.25	2.7	*51.4*
77	15.47	1,645	13.1	8.1	14.6	*89.7*	*55.5*	3.7	3.85	*96.1*	5.85	2.6	*44.4*
82.4	14.97	1,500	12.0	7.5	13.8	*87*	*54.3*	3.58	3.9	*91.7*	5.25	2.65	*50.5*
84.7	15.23	1,505	13.1	8.0	13.9	*94.2*	*57.5*	3.82	4.0	*95.6*	5.5	2.7	*49.1*
79.1	15.17	1,430	12.6	7.6	14.3	*88.1*	*53.2*	3.3	4.02	*82*	5.4	2.65	*49.1*
(67.0)	15.40	1,600	-------	-------	14.8	--------	-------	3.75	4.35	*86.2*	5.95	3.0	*50.4*
81.2	15.47	1,540	13.2	7.9	14.3	*92.3*	*55.2*	3.45	3.65	*94.5*	5.5	2.7	*49.1*
81.2	15.47	1,450	12.8	8.0	14.4	*88.9*	*55.6*	3.8	4.0	*95*	5.45	2.35	*43.1*
79.5	15.23	1,520	12.2	7.4	14.0	*87.1*	*52.9*	3.5	3.88	*90.3*	5.2	2.5	*48.1*
76.3	15.33	1,600	12.9	8.3	14.2	*90.8*	*58.4*	3.9	4.05	*96.3*	5.9	2.6	*44.1*
81.1	15.60	1,575	-------	-------	14.6	--------	-------	3.7	4.18	*89.7*	5.3	2.4	*45.3*
74.2	15.03	1,360	-------	-------	14.4	--------	-------	3.52	4.0	*88.1*	5.3	2.9	*54.7*
78.5	15.37	1,640	12.5	7.4	13.7	*91.2*	*54*	3.7	4.18	*89.7*	5.5	2.6	*47.3*
(14)	(15)	(15)	(12)	(12)	(15)	*(12)*	*(12)*	(15)	(15)	*(15)*	(15)	(15)	*(15)*
--------	229.73	22,910	151.2	92.2	213.5	--------	-------	54.12	59.8	--------	82.3	39.6	-------
79.2	*15.31*	*1,527*	*12.6*	*7.68*	*14.23*	*88.5*	*54*	*3.61*	*3.99*	*90.7*	*5.49*	*2.64*	*48.1*
74.2	14.67	1,350	12	7	13.5	*84.2*	*50.7*	3.3	3.65	*82*	5.2	2.35	*43.1*
84.7	15.90	1,650	13.2	8.3	15.2	*94.2*	*58.4*	3.9	4.35	*96.3*	5.95	3	*54.7*

Brulé Sioux Indian crania—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
225,221	U. S. N. M.	Near Camp Sheridan, Nebr.	Adult		18.3	13.7	12.6	*74.9*
243,700	do	Camp Sheridan, Nebr.	do		17.9	13.6	12.0	*76*
243,380	do	Fort Randall, S. Dak.	do		17.8	13.7	12.3	*77*
243,374	do	Near Camp Sheridan, Nebr.	do		17.7	13.7	12.6	*77.4*
243,705	do	do	do		17.3	13.4	12.2	*77.5*
243,375	do	do	do		18.0	14.0	12.8	*77.8*
225,261	do	do	do		17.5	13.8	12.0	*78.9*
225,233	do	do	do		16.6	13.1	11.9	*78.9*
243,370	do	do	do		18.1	14.4	12.9	*79.6*
243,708	do	do	do		18.0	14.7	12.5	*81.7*
Totals					(10) 177.2	(10) 138.1	(10) 123.8	*(10)*
Averages					*17.72*	*13.81*	*12.38*	*77.9*
Minima					16.6	13.1	11.9	*74.9*
Maxima					18.3	14.7	12.9	*81.7*

Oglala Sioux Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,245	U. S. N. M.	Fort Pierre, S. Dak.	Adult		18.4	13.8	12.9	*75*
225,235	do	Old Red Cloud agency Dak.	do		18.4	14	12.6	*76.1*
243,710	do	Niobrara River, Nebr.	do		18.0	13.7	13.2	*76.1*
243,242	do	Fort Pierre, S. Dak.	do		18.9	14.4	12.5	*76.2*
243,247	do	do	do		18.6	14.2	13.1	*76.3*
243,711	do	Niobrara River	do		18.9	14.5	12.9	*76.7*
243,251	do	Fort Pierre, S. Dak.	do	Very slight occipital compression.	19.2	14.8	13.0	*77.1*
243,248	do	do	do	Slight asymmetry.	18.9	14.8	13.4	*78.3*
243,244	do	do	do		18.7	14.7	12.6	*78.6*
243,246	do	do	do		18.9	14.9	13.6	*78.8*
243,721	do	Niobrara River, Nebr.	do		18.3	14.6	12.9	*79.8*
225,062	do	Fort Randall, S. Dak.	do		18.3	14.6	12.5	*79.8*
243,249	do	Fort Pierre, S. Dak.	do	Slight posterior compression.	18.1	14.7	12.8	*81.2*
225,065	do	do	do		18.9	15.4	13.9	*81.5*
Totals					(14) 260.50	(14) 203.10	(14) 181.90	*(14)*
Averages					*18.61*	*14.51*	*12.99*	78
Minima					18.00	13.70	12.50	75
Maxima					19.20	15.40	13.90	*81.5*

Brulé Sioux Indian crania—Continued

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
78.7	14.87	1,430	10.9	6.9	13.1	*83.2*	*52.7*	3.65	3.75	*97.3*	5.0	2.6	*52*
76.2	14.50	1,250	11.8	7.5	13.9	*84.9*	*54.0*	3.8	4.0	*95*	5.3	2.55	*48.1*
78.1	14.60	-------	11.7	7.3	13.4	*87.3*	*54.5*	3.7	4.05	*91.4*	5.45	2.75	*50.5*
80.3	14.67	1,370	11.4	7.1	13.0	*87.7*	*54.6*	3.7	3.95	*93.7*	5.25	2.5	*47.6*
79.5	14.30	1,300	11.6	7.1	13.3	*87.2*	*53.4*	3.42	3.7	*92.6*	5.05	2.2	*43.6*
80.0	14.93	1,380	11.4	7.1	13.5	*84.4*	*52.6*	3.7	3.95	*93.7*	5.15	2.5	*48.5*
76.7	14.43	1,300	12.0	7.5	13.2	*90.9*	*56.8*	3.52	3.78	*93.4*	5.45	2.55	46.8
80.1	13.87	1,200	11.4	6.9	13.1	*87.0*	*52.7*	3.48	3.85	*90.3*	4.95	2.3	*46.5*
79.4	15.13	1,450	12.2	7.7	13.8	*88.4*	*55.8*	3.6	3.9	*92.3*	5.55	2.6	*46.8*
76.5	15.07	1,490	12.0	7.3	13.5	*88.9*	*54.1*	3.6	3.75	*96*	5.0	2.5	*50*
(10)	(10)	(9)	(10)	(10)	(10)	*(10)*	*(10)*	(10)	(10)	*(10)*	(10)	(10)	*(10)*
--------	146.37	12,170	116.4	72.4	133.8	--------	--------	36.17	38.68	--------	52.15	25.05	------
77.9	*14.64*	*1,352*	*11.64*	*7.24*	*13.38*	*87*	*54.1*	*3.62*	*3.87*	*93.5*	*5.22*	*2.50*	*48.0*
76.2	13.87	1,200	10.9	6.9	13	*83.2*	*52.6*	3.42	3.7	*90.3*	4.95	2.2	*43.6*
80.3	15.13	1,490	12.2	7.7	13.9	*90.9*	*56.8*	3.8	4.05	*97.3*	5.55	2.75	*52*

Oglala Sioux Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
80.1	15.03	1,510	-------	7.7	14.1	--------	*54.6*	3.75	3.85	*97.4*	5.4	2.5	*46.3*
77.8	15.00	1,435	11.9	7.3	13.5	*88.2*	*54.1*	3.5	4.0	*87.5*	5.3	2.5	*47.2*
83.3	14.97	1,340	12.7	7.7	14.4	*88.2*	*53.5*	3.45	4.08	*84.7*	5.5	2.5	45.4
75.1	15.27	1,460	-------	7.6	14.0	--------	*54.3*	3.7	3.95	*93.7*	6.1	2.9	*47.5*
79.9	15.30	1,490	-------	7.5	14.5	--------	*51.7*	3.52	4.1	*86*	5.3	2.7	*50.9*
77.3	15.43	1,500	-------	7.4	14.8	--------	*50*	4.02	4.32	*93.1*	5.5	3.15	*57.3*
76.5	15.67	1,620	11.7	7.5	14.2	*82.4*	*52.8*	3.75	4.18	*89.8*	5.4	2.6	*48.2*
79.5	15.70	1,500	-------	7.9	15.2	--------	*52*	3.6	4.15	*86.8*	5.75	2.9	*50.4*
75.5	15.33	1,570	-------	7.7	13.8	--------	*55.8*	3.48	4.02	*86.3*	5.55	2.6	*46.8*
80.5	15.80	1,540	-------	-------	14.8	--------	--------	3.7	4.15	*89.2*	5.4	3.3	*61.1*
78.4	15.27	1,450	11.7	7.3	15.1	*77.5*	*48.3*	3.6	4.15	*86.8*	5.7	2.9	*50.9*
76.0	15.13	1,515	11.9	7.4	13.9	*85.6*	*53.2*	3.5	4.05	*86.4*	5.25	2.8	*53.3*
78.0	15.20	1,560	-------	-------	-------	--------	--------	3.42	3.75	*91.3*	5.35	2.7	*50.5*
81.0	16.07	1,665	12.6	7.9	15.0	*84*	*52.7*	3.85	4.08	*94.5*	6.0	2.9	*48.3*
(14)	(14)	(14)	(6)	(12)	(13)	*(6)*	*(12)*	(14)	(14)	*(14)*	(14)	(14)	*(14)*
--------	215.17	21,155	72.50	90.90	187.30	--------	--------	50.84	56.83	--------	77.50	38.95	------
78.5	*15.37*	*1,511*	*12.08*	*7.58*	*14.41*	*84.2*	*52.7*	*3.63*	*4.06*	*89.5*	*5.54*	*2.78*	*50.3*
75.1	14.97	1,340	11.70	7.30	13.50	*77.5*	*48.3*	3.42	3.75	*84.7*	5.25	2.50	*45.4*
83.3	16.07	1,665	12.70	7.90	15.20	*88.2*	*55.8*	4.02	4.32	*97.4*	6.10	3.30	*61.1*

Oglala Sioux Indian crania—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
251,997	U. S. N. M.	South Dakota	Adult		18.0	13.6	12.6	*75.6*
243,352	do	Camp Robinson, Nebr.	do		18.3	13.9	12.3	*76*
243,343	do	Fort Sully, S. Dak.	do		18.4	14.0	12.5	*76.1*
243,351	do	Fort Randall, S. Dak.	do		17.3	13.3	12.6	*76.9*
243,722	do	Fort Laramie, Wyo.	do		17.9	14.0	12.8	*78.2*
225,218	do	Red Cloud Agency, S. Dak.	do		17.4	14.2	12.8	*81.6*
243,243	do	Fort Pierre, S. Dak.	do		17.6	14.4	12.3	*81.8*
					(7)	(7)	(7)	(7)
Totals					124.90	97.40	87.90	
Averages					*17.84*	*13.91*	*12.56*	*78.0*
Minima					17.30	13.30	12.30	*75.6*
Maxima					18.40	14.40	12.80	*81.8*

Sisseton Sioux Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,368	U. S. N. M.	Fort Sisseton, S. Dak.	Adult		18.4	13.6	12.8	*73.9*
225,478	do	do	do		18.6	13.8	13.0	*74.2*
243,361	do	do	do		18.7	14.4	13.3	*77.0*
225,217	do	do	do		18.1	14.3	13.0	*79.0*
					(4)	(4)	(4)	(4)
Totals					73.80	56.10	52.10	
Averages					*18.45*	*14.02*	*13.02*	*76.0*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,357	U. S. N. M.	Fort Sisseton, S. Dak.	Adult		17.6	13.6	12.9	*77.3*
243,367	do	do	do		17.6	13.7	11.8	*77.8*
243,558	do	do	do		16.5	13.6	12.4	*82.4*
					(3)	(3)	(3)	(3)
Totals					51.7	40.9	37.1	
Averages					*17.23*	*13.63*	*12.37*	*79.2*

Oglala Sioux Indian crania—Continued

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
79.7	14.73	1,205	-------	6.8	13.7	--------	49.6	3.25	3.9	83.3	5.15	2.9	56.3
76.4	14.83	1,330	11.6	7.0	13.2	87.9	53	3.65	3.85	94.8	5.15	2.5	48.5
77.2	14.97	1,400	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
82.3	14.40	1,240	11.0	6.9	13.0	84.6	53.1	3.58	3.72	96	4.95	2.3	46.5
80.3	14.90	1,350	-------	-------	13.8	--------	-------	3.55	4.2	84.5	5.1	2.65	52
81	14.80	1,390	11.4	7.1	13.8	82.6	51.4	3.4	3.88	87.7	5.2	2.55	49
76.9	14.78	1,440	-------	7	13.1	--------	53.4	3.65	3.95	92.4	5.2	2.6	50
(7)	(7)	(7)	(3)	(5)	(6)	(3)	(5)	(6)	(6)	(6)	(6)	(6)	(6)
--------	103.41	9,355	34.00	34.80	80.60	--------	-------	21.08	23.50	-------	30.75	15.50	------
79.1	14.77	1,336	11.33	6.96	13.43	85	52.1	3.51	3.92	89.7	5.12	2.58	50.4
76.4	14.40	1,205	11.00	6.80	13.00	82.6	49.6	3.25	3.72	83.3	4.95	2.30	46.5
82.3	14.97	1,440	11.60	7.10	13.80	87.9	53.4	3.65	4.20	96	5.20	2.90	56.3

Sisseton Sioux Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
80	14.93	1,270	-------	6.7	13.3	--------	50.4	3.5	3.98	88.0	4.9	2.4	49
80.3	15.13	1,415	12.7	7.9	14.0	90.7	56.4	3.68	3.98	92.4	6.0	2.7	45
80.4	15.47	1,450	11.7	7.1	14.0	83.6	50.7	3.48	3.65	95.3	5.2	2.65	51
80.2	15.13	1,440	11.7	7.3	13.7	85.4	53.3	3.3	3.8	86.8	5.5	2.7	49.1
(4)	(4)	(4)	(3)	(4)	(4)	(3)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
--------	60.66	5,575	36.1	29.0	55.0	--------	-------	13.96	15.41	--------	21.6	10.45	------
80.2	15.17	1,394	12.03	7.25	13.75	86.6	52.7	3.49	3.85	90.6	5.4	2.61	48.4

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total*	*Facial Index, upper*	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
82.7	14.70	1,310	-------	7.0	12.5	--------	56	3.2	3.7	86.5	5.2	2.6	50
75.4	14.37	1,220	-------	7.2	13.2	--------	54.5	3.68	3.8	96.7	5.5	2.75	50
82.4	14.17	1,245	11.2	7.1	12.8	87.5	55.5	3.48	3.4	102.4	5.1	2.45	48.0
(3)	(3)	(3)	-------	(3)	(3)	--------	(3)	(3)	(3)	(3)	(3)	(3)	(3)
--------	43.24	3,775	-------	21.3	38.5	--------	-------	10.36	10.9	--------	15.8	7.80	------
80.1	14.41	1,258	-------	7.1	12.83	--------	55.3	3.45	3.63	95.0	5.27	2.60	49

Yankton Sioux Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,332	U. S. N. M.	Fort Buford, N. Dak.	Adult		18.2	13.4	13.0	*73.6*
225,262	do	Fort Rice, N. Dak.	do		18.9	14.1	13.5	*74.6*
243,337	do	Fort Randall, S. Dak.	do		17.6	13.6	12.8	*77.3*
243,336	do	James River S. Dak.	do		18.0	14.6	13.0	*81.1*
243,334	do	Fort Randall, S. Dak.	do		16.9	14.0	12.6	*82.8*
					(5)	(5)	(5)	(5)
Totals					89.6	69.7	64.9	
Averages					*17.92*	*13.94*	*12.98*	77.8

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,333	U. S. N. M.	Fort Sisseton, S. Dak.	Adult		17.9	13.6	13.0	*76*
243,339	do	Fort Randall, S. Dak.	do		17.8	14.3	13.3	*80.3*
243,335	do	do	do		16.9	14.0	12.8	*82.8*
					(3)	(3)	(3)	(3)
Totals					52.6	41.9	39.1	
Averages					*17.53*	*13.97*	*13.03*	79.6

[1] 3 mm. added for wear of teeth.

Siouan type Indian crania, Montana

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,662	U. S. N. M.	Fort Assiniboine	Adult		18.8	14.4	13.0	*76.6*
243,661	do	Fort Peck	do		19.0	15.0	12.7	*79*
243,658	do	Fort Ellis	do		17.8	14.5	12.8	*81.5*
243,656	do	do	do		18.3	15.0	12.8	*82*
					(4)	(4)	(4)	(4)
Totals					73.9	58.9	51.3	
Averages					*18.48*	*14.73*	*12.83*	79.7

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
244,026	U. S. N. M.	Fort Benton	Adult		17.8	13.8	12.6	*77.5*
243,665	do	Tongue River	do		17.4	13.9	[1] 13.2	*79.9*
225,074	do	Medicine Lake Creek.	do		17.6	14.7	13	*83.5*
					(3)	(3)	(3)	(3)
Totals					52.8	42.4	38.8	
Averages					*17.60*	*14.13*	*12.93*	80.3

[1] Near.

Yankton Sioux Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
82.3	14.87	1,380	12.3	8.0	14.2	*86.6*	*56.3*	3.8	4.2	*90.5*	5.8	2.6	*44.8*
81.8	15.50	1,580	12.4	7.5	14.6	*84.9*	*51.4*	3.6	3.9	*92.3*	5.3	3.1	*58.5*
82	14.67	1,280	11.3	6.8	13.7	*82.5*	*49.6*	3.5	3.75	*93.3*	5.0	2.5	*50*
79.8	15.20	1,445	12.8	8.4	14.5	*88.3*	*57.9*	3.65	4.1	*89.0*	5.85	3.0	*51.3*
81.6	14.50	1,275	[1]11.8	7.4	13.9	*84.9*	*53.2*	3.4	3.8	*89.5*	5.3	2.25	*42.4*
(5) ------- *81.5*	(5) 74.74 *14.94*	(5) 6,960 *1,392*	(5) 60.60 *12.12*	(5) 38.1 *7.62*	(5) 70.9 *14.18*	(5) ------- *85.5*	(5) ------- *53.7*	(5) 17.95 *3.59*	(5) 19.75 *3.95*	(5) ------- *90.9*	(5) 27.25 *5.45*	(5) 13.45 *2.69*	(5) ------- *49.4*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total*	*Facial Index, upper*	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
82.5	14.83	1,465	11.4	7.3	13.2	*86.4*	*55.3*	3.4	3.92	*86.7*	5.3	2.7	*50.9*
82.9	15.13	1,485	11.2	7.0	13.5	*83*	*51.9*	3.6	3.95	*91.1*	5.15	2.7	*52.4*
82.8	14.57	1,300	11.2	6.8	13.0	*86.2*	*52.3*	3.4	3.72	*91.4*	4.95	2.8	*56.6*
(3) ------- *82.7*	(3) 44.53 *14.84*	(3) 4,250 *1,417*	(3) 33.8 *11.27*	(3) 21.1 *7.03*	(3) 39.7 *13.23*	(3) ------- *85.1*	(3) ------- *53.2*	(3) 10.4 *3.47*	(3) 11.59 *3.86*	(3) ------- *89.7*	(3) 15.40 *5.13*	(3) 8.2 *2.73*	(3) ------- *53.2*

Siouan type Indian crania, Montana

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
78.3	15.40	1,460	-------	7.6	-------	-------	-------	3.4	4.0	*85*	5.4	2.5	*46.3*
74.7	15.57	1,460	12.4	7.6	14.7	*84.4*	*51.7*	3.5	4.05	*86.4*	5.5	2.6	*47.3*
79.3	15.03	1,365	-------	7.7	14.4	-------	*53.5*	3.55	3.95	*89.9*	5.7	2.5	*43.9*
76.9	15.37	1,510	13.2	8.2	14.4	*91.7*	*56.9*	3.8	4.1	*92.7*	6.1	2.6	*42.6*
(4) ------- *77.3*	(4) 61.37 *15.34*	(4) 5,795 *1,449*	(2) 25.6 *12.8*	(4) 31.1 *7.8*	(3) 43.5 *14.5*	(2) ------- *88*	(3) ------- *54*	(4) 14.25 *3.56*	(4) 16.1 *4.02*	(4) ------- *88.5*	(4) 22.7 *5.68*	(4) 10.2 *2.55*	(4) ------- *44.9*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total*	*Facial Index, upper*	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
79.8	14.73	1,250	-------	7	-------	-------	-------	3.5	3.8	*92.1*	4.95	-------	-------
84.4	14.83	1,295	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
80.5	15.10	1,380	-------	6.9	13.9	-------	*49.6*	3.45	3.9	*88.5*	5.2	2.9	*55.8*
(3) ------- *81.5*	(3) 44.66 *14.89*	(3) 3,925 *1,308*	-------	(2) 13.9 *6.95*	-------	-------	-------	(2) 6.95 *3.48*	(2) 7.7 *3.85*	(2) ------- *90.4*	(2) 10.15 *5.07*	-------	-------

Mandan Indian crania

MALE

Catalogue No	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,385	U. S. N. M.	Fort Berthold, N. Dak.	Adult		18.6	14	13.2	*75.3*
262,136	do	Mandan village site, N. Dak.	do		17.8	13.8	13.4	*77.5*
Totals					(2) 36.4	(2) 27.8	(2) 26.6	(*2*)
Averages					*18.2*	*13.9*	*13.3*	*76.4*

Crow Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,787	U. S. N. M.	Ogallala, Nebr.	Adult		17.8	13.5	12.0	*75.8*
243,788	do	Fort Benton, Nebr.	do		17.7	14.0	13.5	*79.1*
Totals					(2) 35.5	(2) 27.5	(2) 25.5	(*2*)
Averages					*17.75*	*13.75*	*12.75*	*77.5*

[1] Teeth worn to gums.

Arikara Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
325,362	U. S. N. M.	Near Mobridge, S. Dak.	Adult		19.4	14.0	13.5	*72.2*
324,718	do	do	do		19.1	13.8	13.5	*72.2*
325,349	do	do	do		18.4	13.5	12.3	*73.4*
325,419	do	do	do		18.7	13.8	13.4	*73.8*
325,365	do	do	do		18.7	13.8	13.4	*73.8*
325,383	do	do	do		18.0	13.3	13.9	*73.9*
324,739	do	do	do		18.1	13.4	13.0	*74.0*
325,345	do	do	do		18.9	14.0	14.0	*74.1*
325,418	do	do	do		17.8	13.2	13.0	*74.2*
325,366	do	do			18.7	14.0	13.3	*74.9*
325,335	do	do	do		19.6	14.7	13.9	*75.0*
325,397	do	do	do		18.8	14.1	13.7	*75.0*
325,377	do	do	do		18.5	13.9	13.4	*75.1*
315,536	do	Flood Plains, Missouri River, S. Dak.	do		18.6	14.0	14.5	*75.3*

Mandan Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
81	15.27	1,500	-------	7.4	-------	-------	-------	3.85	3.75	102.7	5.6	2.5	44.6
84.8	15.00	1,470	-------	7.8	13.5	-------	57.8	3.50	3.82	91.6	5.5	2.6	47.3
(2)	(2)	(2)		(2)				(2)	(2)	(2)	(2)	(2)	(2)
-------	30.27	2,970	-------	15.2	-------	-------	-------	7.35	7.57	-------	11.1	5.1	
82.9	15.14	1,485	-------	7.6	-------	-------	-------	3.67	3.78	97.1	5.55	2.55	45.9

Crow Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
76.7	14.43	1,240	[1] 11.8	7.3	12.8	92.2	57.0	3.48	3.9	89.2	5.1	2.5	49.0
85.2	15.07	1,340	[1] 11.4	7.3	13.7	83.2	53.3	3.5	3.9	89.7	5.45	3.15	57.8
(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
-------	29.50	2,580	23.2	14.6	26.5	-------	-------	6.98	7.8	-------	10.55	5.65	-------
81	14.75	1,290	11.6	7.3	13.25	87.5	55.1	3.49	3.9	89.5	5.27	2.82	53.6

Arikara Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
80.8	15.63	1,475	12.9	7.8	14.8	87.2	52.7	3.78	4.22	89.6	5.7	2.95	51.8
82.1	15.47	1,520	12.4	8.0	13.5	91.8	59.3	3.76	4.05	92.8	5.8	2.25	38.8
77.1	14.73	1,280	12.5	7.8	14.0	89.3	55.7	3.51	4.00	87.8	5.6	2.5	44.6
82.5	15.30	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
82.5	15.30	1,510	12.4	7.3	14.4	86.1	50.7	3.55	4.00	88.8	5.5	2.9	52.7
88.8	15.07	1,380	12.1	7.5	13.5	89.6	55.6	3.50	3.90	89.7	5.4	2.5	46.3
82.5	14.83	1,370	13.0	8.2	13.3	97.7	61.6	3.51	3.92	89.5	5.8	2.45	42.2
85.1	15.63	1,565	-------	7.9	14.0	-------	56.4	-------	-------	-------	5.5	2.7	49.1
83.9	14.67	1,290	-------	7.1	13.3	-------	53.4	3.60	4.00	90.0	5.4	2.4	44.4
81.4	15.33	1,435	11.1	6.9	13.7	81.0	50.4	3.52	3.75	93.9	5.3	2.7	50.9
81.0	16.07	1,760	12.3	8.0	14.7	83.7	54.4	3.58	3.95	90.6	5.6	2.9	51.8
83.3	15.53	1,570	12.7	7.7	14.9	85.2	51.7	3.60	4.05	88.9	5.8	2.7	46.6
82.7	15.27	1,355	11.5	7.7	14.1	81.6	54.7	3.74	3.95	94.7	5.5	2.8	50.9
89.0	15.70	1,610	13.1	8.0	14.1	92.9	56.7	3.35	3.95	84.9	5.3	2.7	50.9

Arikara Indian crania—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
325, 341	U. S. N. M.	Near Mobridge, S. Dak.	Adult		18.3	13.8	13.7	*75.4*
325, 375	do	do	do		18.5	14.0	14.1	*75.7*
325, 363.	do	do	do		18.4	14.0	13.3	*76.1*
771	Univ. S. Dak.	Flood Plains, Missouri River, S. Dak.	do		19.3	14.7	13.6	*76.2*
2, 198	do	do	do		18.2	13.9	13.6	*76.4*
315, 533	U. S. N. M.	do	do		18.8	14.4	13.4	*76.6*
325, 396	do	Near Mobridge, S. Dak.	do		19.0	14.6	14.0	*76.8*
2, 193	Univ. S. Dak.	Flood Plains, Missouri River, S. Dak.	do		18.1	13.9	14.1	*76.8*
325, 434	U. S. N. M.	Near Mobridge, S. Dak.	do		18.8	14.5	13.3	*77.1*
325, 369	do	do	do		18.8	14.6	12.8	*77.7*
325, 372	do	do	do		18.6	14.5	14.4	*78.0*
2, 159	Univ. S. Dak.	Flood Plains, Missouri River, S. Dak.	do		18.2	14.2	13.9	*78.0*
325, 433	U. S. N. M.	Near Mobridge, S. Dak.	do		18.2	14.2	13.6	*78.0*
325, 364	do	do	do		17.9	14.0	13.4	*78.2*
325, 350	do	do	do		18.0	14.1	12.9	*78.3*
325, 376	do	do	do		18.2	14.3	13.0	*78.6*
315, 535	do	Flood Plains, Missouri River, S. Dak.	do		18.2	14.4	12.6	*79.1*
325, 360	do	Near Mobridge, S. Dak.	do		18.0	14.3	13.2	*79.4*
325, 378	do	do	do		18.0	14.3	13.2	*79.4*
2, 213	Univ. S. Dak.	Flood Plains, Missouri River, S. Dak.	do		18.7	14.9	13.4	*79.7*
325, 381	U. S. N. M.	Near Mobridge, S. Dak.	do		18.3	14.6	13.2	*79.8*
325, 385	do	do	do		17.8	14.2	13.5	*79.8*
2, 188	Univ. S. Dak.	Flood Plains, Missouri River, S. Dak.	do		17.4	13.9	12.9	*79.9*
325, 435	U. S. N. M.	Near Mobridge, S. Dak.	do		17.8	14.3	13.6	*80.3*
325, 336	do	do	do		17.9	14.5	13.3	*81.0*
325, 348	do	do	do		18.2	14.8	13.2	*81.3*
315, 542	do	Upper Missouri River, S. Dak.	do		18.2	14.8	13.4	*81.3*
2, 208	Univ. S. Dak.	Flood Plains, Missouri River, S. Dak.	do	Slight occipital compression.	17.6	14.3	------	*81.3*
325, 420	U. S. N. M.	Near Mobridge, S. Dak.	do		17.6	14.4	13.2	*81.8*
315, 538	do	Flood Plains, Missouri River, S. Dak.	do	Very slight occipital compression.	17.7	14.5	13.4	*81.9*
325, 391	do	Near Mobridge, S. Dak.	do		18.0	14.8	13.6	*82.2*
325, 353	do	do	do		18.2	15.0	14.3	*82.4*
978	Univ. S. Dak.	Flood Plains, Missouri River, S. Dak.	do		18.0	14.9	12.9	*82.8*
325, 388	U. S. N. M.	Near Mobridge, S. Dak.	do		17.6	14.6	14.0	*83.0*
325, 395	do	do	do		17.7	14.7	13.6	*83.0*
325, 368	do	do	do	Very slight occipital flattening.	17.5	14.6	14.1	*83.4*
315, 543	do	Flood Plains, Missouri River, S. Dak.	do		17.4	14.7	12.7	*84.5*

Arikara Indian crania—Continued

MALE—Continued

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
85.4	15.27	1,465	12.9	7.8	13.7	94.2	56.9	3.92	3.92	100.0	5.55	2.9	52.3
86.8	15.53	1,550	12.3	7.4	13.7	89.8	54.0	3.98	4.04	98.5	5.7	2.5	43.9
82.1	15.23	1,470	11.7	7.2	14.0	83.6	51.4	3.77	4.00	94.2	5.35	2.7	50.5
80.0	15.87	-------	12.9	7.5	15.1	85.4	49.7	------	-------	--------	5.7	2.8	49.1
84.7	15.23	-------	12.5	7.9	13.3	94.0	59.4	------	-------	--------	5.4	2.4	44.4
80.7	15.53	1,575	11.7	7.5	14.2	82.4	52.8	3.35	3.9	85.9	5.3	2.4	45.3
83.3	15.87	1,645	13.4	7.9	14.4	93.1	54.9	3.57	4.15	86.0	5.7	2.5	43.9
88.1	15.37	-------	13.4	8.4	14.2	94.4	59.2	------	-------	--------	5.8	2.7	46.5
79.9	15.53	1,605	-------	7.3	14.2	--------	51.4	3.66	4.05	90.4	5.5	2.55	46.4
76.6	15.40	1,480	12.3	7.6	14.7	83.7	51.7	3.54	4.00	88.5	5.6	3.0	53.6
87.0	15.83	1,525	12.8	7.9	14.2	90.1	55.6	3.70	4.10	90.2	5.7	2.7	47.4
85.8	15.43	-------	12.2	7.7	13.9	87.8	55.4	------	-------	--------	5.4	2.6	48.2
84.0	15.33	1,465	-------	7.8	13.9	--------	56.1	3.41	3.84	88.8	5.4	2.5	46.3
84.0	15.10	1,390	11.0	-------	14.1	78.0	-------	3.58	3.90	91.8	5.4	2.9	53.7
80.4	15.00	1,430	11.9	7.9	14.6	81.5	54.1	3.91	4.10	95.4	6.0	2.6	43.3
80.0	15.17	1,475	12.4	7.8	14.6	84.9	53.4	3.72	3.80	97.9	5.85	2.55	43.6
77.3	15.07	1,440	12.2	7.6	13.5	90.4	56.3	4.15	4.10	101.2	5.6	2.5	44.6
81.7	15.17	1,410	11.9	7.6	14.2	83.8	53.5	3.77	4.02	93.8	5.9	2.4	40.7
81.7	15.17	1,400	11.8	7.4	14.1	83.7	52.5	3.60	4.20	85.7	5.4	2.5	46.3
79.8	15.70	-------	11.3	7.0	14.3	79.0	48.9	------	-------	--------	5.3	2.6	49.1
80.2	15.37	1,420	12.4	7.8	14.9	83.2	52.3	3.68	4.20	87.6	5.4	2.65	49.1
84.4	15.17	1,485	11.6	7.1	14.3	81.1	49.6	3.66	4.01	91.3	5.4	2.75	50.9
82.4	14.73	-------	12.3	7.5	14.1	87.2	53.2	------	-------	--------	5.4	2.6	48.1
84.7	15.23	1,470	-------	7.3	14.3	--------	51.0	3.39	3.67	92.4	5.45	2.85	52.3
82.1	15.23	1,450	11.6	7.3	14.2	81.7	51.4	3.52	3.89	90.5	5.25	2.7	51.4
80.0	15.40	1,690	11.5	7.4	13.9	82.7	53.2	3.63	4.01	90.5	5.4	2.6	48.2
81.2	15.47	1,590	12.9	8.1	13.8	93.5	58.7	3.55	3.90	91.0	5.8	2.6	44.8
--------	--------	-------	12.0	7.4	-------	--------	-------	------	-------	--------	5.7	2.5	43.9
82.5	15.07	1,425	12.5	7.8	14.4	86.8	54.2	4.05	4.09	99.0	5.8	2.7	46.6
83.2	15.20	1,460	11.0	7.0	14.0	78.6	50.0	3.35	3.90	85.9	5.1	2.6	51.0
82.9	15.47	1,545	12.6	7.9	14.6	86.3	54.1	4.00	3.88	103.1	5.9	2.35	39.8
86.1	15.83	-------	12.4	7.7	14.6	84.9	52.7	3.38	3.95	85.6	5.55	2.85	51.3
78.4	15.27	-------	12.6	7.9	14.7	85.7	53.7	------	-------	--------	6.0	2.7	45.0
87.0	15.07	1,495	12.3	7.1	14.3	86.0	49.7	3.44	4.00	86.0	5.7	2.6	45.6
84.0	14.67	1,460	12.0	7.1	13.7	87.6	51.8	3.50	3.90	89.7	5.3	2.45	46.2
87.9	15.40	1,450	11.9	7.6	14.7	80.9	51.7	3.75	4.05	92.6	5.8	2.9	50.0
79.1	14.93	1,385	-------	7.3	13.4	--------	54.5	3.50	3.90	89.7	5.3	2.4	45.3

Arikara Indian crania—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
325,390	U. S. N. M.	Near Mobridge, S. Dak.	Adult	Slight occipital flattening.	(17.0)	(14.5)	(13.2)	*(85.3)*
325,424	do	do	do	Asymmetry	(17.7)	(15.5)	(13.8)	
2,196	Univ. S. Dak.	Flood Plains, Missouri River, S. Dak.	do					
					(51)	(51)	(50)	*(51)*
Totals					932.4	726.7	673.2	
Averages					*18.28*	*14.25*	*13.46*	*77.9*
Minima					17.4	13.2	12.3	*72.2*
Maxima					19.6	15	14.5	*84.5*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
325,370	U. S. N. M.	Near Mobridge, S. Dak.	Adult		17.9	13.0	13.2	*72.6*
325,416	do	do	do		18.0	13.1	12.7	*72.8*
325,380	do	do	do		18.8	13.7	12.9	*72.9*
325,374	do	do	do		18.2	13.4	13.4	*73.6*
325,384	do	do	do		18.0	13.5	12.7	*75.0*
325,400	do	do	do		17.6	13.2	12.8	*75.0*
325,371	do	do	do		17.4	13.1	13.1	*75.3*
325,358	do	do	do		17.4	13.1	12.5	*75.3*
315,537	do	Flood Plains, Missouri River, S. Dak.	do		17.8	13.4	13.0	*75.3*
2,162	Univ. S. Dak.	do	do		17.5	13.2	12.6	*75.4*
2,206	do	do	do		17.8	13.5	13.0	*75.8*
325,355	U. S. N. M.	Near Mobridge, S. Dak.	do		17.1	13.0	13.4	*76.0*
325,352	do	do	do		17.6	13.5	12.6	*76.7*
325,379	do	do	do		17.4	13.4	13.3	*77.0*
325,998	do	do	do		17.0	13.1	12.1	*77.1*
315,540	do	Upper Missouri River, S. Dak.	do		17.2	13.3	13.0	*77.3*
325,337	do	Near Mobridge, S. Dak.	do		17.7	13.7	12.5	*77.4*
325,387	do	do	do		17.4	13.5	12.5	*77.6*
315,531	do	Flood Plains, Missouri River, S. Dak.	do		17.6	13.7	12.7	*77.8*
315,539	do	do	do		17.4	13.6	12.6	*78.2*
325,373	do	Near Mobridge, S. Dak.	do		16.6	13.0	13.2	*78.3*
325,367	do	do	do		16.8	13.2	13.2	*78.6*
325,389	do	do	do		17.3	13.6	12.7	*78.6*
2,163	Univ. S. Dak.	Upper Missouri River, S. Dak.	do		17.8	14.0		*78.6*
325,357	U. S. N. M.	Near Mobridge, S. Dak.	do		17.1	13.5	13.1	*79.0*
325,338	do	do	do		17.2	13.7	12.6	*79.6*
325,342	do	do	do		17.3	13.8	12.8	*79.8*
325,415	do	do	do		16.9	13.5	12.2	*79.9*
325,432	do	do	do		17.3	13.9	12.8	*80.4*
325,359	do	do	do		16.6	13.4	12.8	*80.7*
325,361	do	do	do		17.8	14.4	13.2	*80.9*
325,351	do	do	do		18.0	14.6	12.3	*81.1*
325,339	do	do	do		17.0	13.8	13.0	*81.2*
325,394	do	do	do		17.1	14.0	13.2	*81.9*
325,392	do	do	do		16.6	13.6	12.6	*81.9*
2,175	Univ. S. Dak.	Upper Missouri River, S. Dak.	do		17.2	14.2	12.6	*82.6*
325,393	U. S. N. M.	Near Mobridge, S. Dak.	do		17.6	14.6	13.3	*83.0*
325,347	do	do	do		17.5	14.7	12.6	*84.0*

Arikara Indian crania—Continued

MALE—Continued

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
83.8	14.90	1,460	11.8	7.3	14.5	81.4	50.3	3.75	4.10	91.5	5.5	2.5	45.4
-------	15.67	1,640	-------	8.1	14.4	-------	56.2	3.93	4.04	97.3	5.7	2.35	41.2
-------	-------	-------	11.6	-------	14	82.9	-------	-------	-------	-------	5.4	2.4	44.4
(50)	(52)	(43)	(46)	(51)	(52)	(45)	(50)	(43)	(43)	(43)	(53)	(53)	(53)
-------	796.41	63,870	561.6	387.8	736	-------	-------	156.71	171.35	-------	294.6	138.8	-------
82.7	15.33	1,485	12.21	7.60	14.15	86.1	53.7	3.64	3.99	90.9	5.56	2.62	47.1
76.6	14.67	1,280	11	6.9	13.3	78	48.9	3.35	3.67	84.9	5.1	2.25	38.8
89	16.07	1,760	13.4	8.4	15.1	97.7	61.6	4.15	4.22	103.1	6	3	53.7

FEMALE

85.4	14.70	1,430	11.4	6.7	13.25	86.0	50.6	3.35	3.80	88.2	5.0	2.7	54
81.7	14.60	1,310	11.8	7.2	12.9	91.5	55.8	3.44	3.90	88.2	5.2	2.6	50
79.4	15.13	1,540	-------	7.4	13.2	-------	56.1	3.76	4.05	92.8	5.7	2.8	49.1
84.8	15.00	1,420	10.9	7.2	13.3	82.0	54.1	3.55	3.85	92.2	5.1	2.5	49.0
80.6	14.40	1,280	11.0	7.1	13.0	84.6	54.6	3.68	4.00	92.0	5.0	2.55	51.0
83.1	14.53	1,350	-------	7.0	13.1	-------	53.4	3.48	3.90	89.2	5.2	2.6	50.0
86.0	14.53	-------	11.3	6.9	12.9	87.6	53.5	3.50	3.75	93.3	5.15	2.45	47.6
82.0	14.33	1,280	10.5	6.6	13.0	80.8	50.8	3.48	3.78	92.1	4.65	2.7	58.1
85.3	14.73	1,350	-------	7.9	12.9	-------	61.2	3.45	3.90	88.5	5.35	2.45	45.8
82.1	14.43	-------	-------	-------	12.8	-------	-------	-------	-------	-------	5.0	2.9	58.0
83.1	14.77	-------	-------	7.3	13.5	-------	54.1	-------	-------	-------	4.8	2.7	56.3
89.0	14.50	1,290	12.3	7.8	12.6	97.6	61.9	3.60	3.87	93.0	5.45	2.15	39.5
81.0	14.57	1,415	11.8	7.0	12.4	95.2	56.4	3.70	3.70	100.0	5.10	2.3	45.1
86.4	14.70	1,345	11.4	7.0	12.5	91.2	56.0	3.37	3.77	89.4	5.3	2.5	47.2
80.5	14.07	1,235	-------	7.5	13.0	-------	57.7	3.86	3.90	99.0	5.2	2.3	44.2
85.3	14.50	1,335	-------	6.6	12.2	-------	54.1	3.3	3.75	88.0	4.8	2.3	47.9
79.6	14.63	1,335	11.6	7.3	12.9	89.9	56.6	3.37	3.97	84.9	5.3	2.4	45.3
80.9	14.47	1,215	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
81.1	14.67	1,395	12.3	7.5	13.0	94.6	57.7	3.7	3.98	93.0	5.5	2.4	43.6
81.3	14.53	1,300	-------	7.5	12.2	-------	61.5	3.45	3.65	94.5	5.3	2.45	46.2
89.2	14.27	-------	11.4	7.2	12.2	93.4	59.0	3.68	3.65	100.8	5.4	-------	-------
88.0	14.40	1,250	11.9	7.6	12.9	92.2	58.9	3.78	3.85	98.2	5.5	2.65	48.2
82.2	14.53	1,290	10.1	6.4	13.4	75.4	47.8	3.40	3.75	90.7	4.9	2.7	55.1
-------	-------	-------	11.9	7.2	13.7	86.9	52.5	-------	-------	-------	5.4	2.6	48.1
85.6	14.57	1,330	12.0	7.7	13.1	91.6	58.8	3.68	3.92	93.9	5.6	2.6	46.4
81.6	14.50	1,260	10.6	6.4	12.7	83.5	50.4	3.50	3.80	92.1	5.0	2.4	48.0
82.3	14.63	1,290	10.8	6.9	13.4	80.6	51.5	3.34	3.88	86.1	5.15	2.55	49.5
80.3	14.20	1,270	11.1	6.8	12.8	86.7	53.1	3.57	3.95	90.4	5.05	2.45	48.4
82.0	14.67	1,450	11.5	7.1	13.3	86.5	53.4	3.69	3.78	97.6	5.15	2.4	46.6
85.3	14.27	1,265	10.8	6.8	12.6	85.7	54.0	3.42	3.70	92.4	5.0	2.65	53
82.0	15.13	1,450	12.4	7.7	13.2	93.9	58.3	3.70	4.00	92.5	5.6	2.6	46.4
75.5	15.30	1,330	11.7	7.6	13.7	85.4	55.5	3.70	3.87	95.6	5.5	2.75	50
84.4	14.60	1,310	12.1	7.6	13.4	90.3	56.7	3.93	3.83	102.6	5.3	2.8	52.8
84.9	14.77	1,420	12.0	7.3	13.2	90.9	55.3	3.27	3.80	86.0	5.1	2.3	45.1
83.4	14.27	1,215	11.2	6.7	13.0	86.2	51.5	3.59	3.85	93.3	4.95	2.65	54.5
80.2	14.67	-------	-------	7.3	13.2	-------	55.3	-------	-------	-------	5.4	2.5	46.3
82.6	15.17	1,445	12.1	7.65	13.5	89.6	56.7	3.68	3.84	95.8	5.5	2.5	45.4
78.3	14.93	1,470	12.5	8.0	13.2	94.7	60.6	3.55	3.75	94.7	5.4	2.6	48.2

Arikara Indian crania—Continued

FEMALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
2,170	Univ. S. Dak.	Upper Missouri River, S. Dak.	Adult		16.9	14.2	13.1	*84.0*
325,421	U. S. N. M.	Near Mobridge, S. Dak.	do		16.8	14.2	12.6	*84.5*
2,173	Univ. S. Dak.	Flood Plains, Missouri River, S. Dak.	do		16.7	14.2	13.1	*85.0*
325,354	U. S. N. M.	Near Mobridge, S. Dak.	do	Slight asymmetry.	(16.5)	(14.4)	(11.8)	*(87.3)*
325,386	do	do	do	Some occipital flattening.				
325,382	do	do	do		17.2		12.8	
325,417	do	do	do					
765	Univ. S. Dak.	Flood Plains, Missouri River, S. Dak.	do					
					(42)	(41)	(41)	*(41)*
Totals					730.1	559.1	526.4	
Averages					*17.38*	*13.64*	*12.84*	78.4
Minima					16.6	13	12.1	*72.6*
Maxima					18.8	14.7	13.4	*85*

Ponka Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,310	U. S. N. M.	Fort Randall, S. Dak.	Adult		18.4	13.8	13.2	*75*
225,285	do	Old Ponka Agency, Dak.	Very near adult.		18.8	14.2	14.0	*75.5*
225,097	do	do	Adult		19.4	14.8	13.9	*76.3*
243,312	do	Fort Randall, S. Dak.	do		18.5	14.2	13.4	*76.8*
243,319	do	do	do		18.1	14.2	13.4	*78.4*
226,500	do	Old Ponka Agency, Dak.	do		17.8	14.1	13.3	*79.2*
243,318	do	Fort Randall, S. Dak.	do		17.6	14.0	12.8	*79.6*
243,309	do	Old Ponka Agency, Dak.	do		18.1	14.6	13.1	*80.7*
243,317	do	Fort Randall, S. Dak.	do		18.3	15.1	13.1	*82.5*
243,326	do	Old Ponka Agency, Dak.	do		17.6	14.8	12.5	*84.1*
243,313	do	Fort Randall, S. Dak.	do	Slight asymmetry.	17.7	15.0	13.0	*84.8*
					(11)	(11)	(11)	*(11)*
Totals					200.3	158.8	145.7	
Averages					*18.21*	*14.44*	*13.25*	79.3
Minima					17.6	13.8	12.5	75
Maxima					19.4	15.1	14	*84.8*

Arikara Indian crania—Continued

FEMALE—Continued

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
84.2	14.73	------	------	------	------	------	------	------	------	------	4.9	------	------
81.3	14.53	1,330	11.1	7.1	13.6	81.6	52.3	3.82	3.90	97.9	5.25	2.45	46.7
84.8	14.67	------	11.1	7.0	13.3	83.5	52.6	------	------	------	4.9	2.5	51.0
(76.4)	13.90	1,315	11.0	6.9	14.3	76.9	48.2	3.49	3.85	90.6	4.9	2.45	50
------	------	------	11.0	6.9	12.8	85.9	53.9	3.55	3.70	96.0	4.85	2.4	49.5
------	------	------	11.8	7.2	13.0	90.8	55.4	------	------	------	5.4	2.65	49.1
------	------	------	11.4	6.9	------	------	------	3.50	3.77	92.8	5.2	2.5	48.1
------	------	------	------	6.5	------	------	------	------	------	------	4.6	2.3	50.0
(40)	(41)	(34)	(34)	(43)	(42)	(33)	(41)	(37)	(37)	(37)	(45)	(43)	(43)
------	598.5	45,550	389.8	307.95	548.15	------	------	131.88	141.96	------	233	108.7	------
82.7	14.60	1,340	11.46	7.16	13.05	87.6	55	3.56	3.84	92.9	5.18	2.53	48.8
75.5	13.90	1,215	10.1	6.4	12.2	75.4	47.8	3.27	3.65	84.9	4.65	2.15	39.5
89.2	15.30	1,540	12.5	8	14.3	97.6	61.9	3.93	4.05	102.6	5.7	2.9	58.1

Ponka Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
82	15.13	1,480	11.6	7.3	13.2	87.9	55.3	3.32	3.8	87.4	5.2	2.6	50
84.8	15.67	1,570	12.3	7.6	13.6	90.4	55.9	3.5	3.8	92.1	5.4	2.6	48.2
81.3	16.03	1,640	11.7	7.2	14.6	80.1	49.6	3.35	4.0	81.2	5.0	2.6	52
82	15.37	1,550	12.6	7.9	15.1	83.4	52.3	3.5	4.15	84.4	5.8	3.0	51.7
83	15.23	1,440	13.0	8.0	14.9	87.2	53.7	3.35	3.9	85.9	5.5	2.7	49.1
83.4	15.07	1,380	------	7.9	13.4	------	59	3.75	3.95	94.9	5.4	2.6	48.2
81.0	14.80	1,430	------	7.3	13.9	------	52.5	3.4	3.7	91.9	5.1	2.5	49.0
80.1	15.27	1,490	12.1	7.8	14.0	86.4	55.7	3.6	4.0	90	5.75	(2.1)	(36.5)
78.4	15.50	1,490	------	7.9	15.0	------	52.7	3.4	4.25	80.0	5.6	2.8	50
77.2	14.97	1,420	11.1	6.7	13.8	80.4	49.6	3.4	3.7	91.9	5.25	2.4	45.7
79.5	15.23	1,505	12.1	7.3	14.1	85.8	51.8	3.7	3.75	98.7	5.2	2.8	53.8
(11)	(11)	(11)	(8)	(11)	(11)	(8)	(11)	(11)	(11)	(11)	(11)	(10)	(10)
------	168.27	16,395	96.5	82.9	15.56	------	------	38.27	43.0	------	59.2	26.6	------
81.2	15.29	1,490	12.06	7.54	14.15	85.2	53.3	3.48	3.91	89	5.38	2.66	49.8
77.2	14.80	1,380	11.1	6.7	13.2	80.1	49.6	3.32	3.7	80	5	2.4	45.7
84.8	16.03	1,640	13	8	15.1	90.4	59	3.75	4.25	98.7	5.75	3	58.8

Ponka Indian crania—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243, 325	U. S. N. M.	Old Ponka Agency, Dak.	Adult		18.0	14.0	12.5	*77.8*
243, 311	do	Old Ponka Agency, Dakota Ter.	do	Very slight in asymmetry.	16.8	13.1	11.8	*78*
243, 327	do	do	do	do	17.4	13.6	13.1	*78.2*
243, 320	do	do	do		17.0	13.4	12.6	*78.8*
225, 099	do	do	do	Very slight asymmetry.	18.0	14.3	13.0	*79.4*
226, 497	do	do	do		18.0	14.4	13.1	*80*
225, 096	do	Old Ponka Agency, Niobrara River.	do		17.5	14.1	13.0	*80.6*
225, 095	do	Ponka Agency, Niobrara River, Dakota, Ter.	do		17.3	14.6	12.2	*84.4*
					(8)	(8)	(8)	(8)
Totals					140.0	111.5	101.3	
Averages					*17.50*	*13.94*	*12.66*	79.6
Minima					16.8	13.1	11.8	77.8
Maxima					18	14.6	13.1	*84.4*

North Dakota Mound Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
228, 876	U. S. N. M.	Mound, Walsh County, N. Dak.	Adult		19.6	13.8	13.1	*70.4*
243, 235	do	Devils Lake Agency, N. Dak.	do		19.0	13.6	12.9	*71.6*
243, 237	do	do	do		18.8	13.5	13.5	*71.8*
228, 885	do	Walsh County, N. Dak.	do		18.4	13.3		*72.3*
243, 915	do	Bismarck, N. Dak.	do		18.8	13.7	12.4	*72.9*
228, 890	do	Walsh County, N. Dak.	do		18.4	13.7	12.7	*74.5*
228, 880	do	do	do		18.9	14.2	High.	*75.1*
228, 884	do	do	do		18.4	14.0	13.6	*76.1*
243, 232	do	Fort Totten	do		13.4	14.2	14.0	*77.2*
228, 837	do	Walsh County, N. Dak.	do		17.8	13.8	12.9	*77.5*
243, 225	do	Fort Totten	do		17.6	13.7	13.0	*77.8*
228, 878	do	Walsh County, N. Dak.	do		18.8	15.1	13.6	*80.3*
228, 881	do	Seymores Place, Walsh County, N. Dak.	do		18.8	15.1		*80.3*
243, 231	do	Fort Totten	do					
228, 888	do	Walsh County, N. Dak.	do					
					(13)	(13)	(10)	(13)
Totals					241.70	181.7	131.7	
Averages					*18.59*	*13.92*	*13.17*	*75.2*
Minima					17.6	13.3	12.4	70.4
Maxima					19.6	15.1	14.0	80.3

Ponka Indian crania—Continued

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
78.1	14.83	1,350	11.2	7.0	13.5	83	51.8	3.7	3.9	94.9	5.2	2.8	53.8
79	13.90	1,220	11.1	7.0	12.8	86.7	54.7	3.5	3.7	94.6	5.1	2.3	45.1
84.5	14.70	1,330	11.5	7.3	13.0	88.5	56.2	3.6	3.7	97.3	5.0	2.5	50
82.9	14.33	1,280	11.1	6.7	13.0	85.4	51.5	3.35	3.9	85.9	5.0	2.1	42
80.5	15.10	1,370	--------	7.0	13.1	--------	53.4	3.48	3.8	91.6	5.3	2.6	49.1
80.9	15.17	1,485	--------	6.4	13.1	--------	48.8	3.35	3.7	90.5	5.0	2.5	50
82.3	14.87	1,270	--------	7.0	13.4	--------	52.2	3.4	3.8	89.5	5.1	2.3	45.1
76.5	14.70	1,245	--------	6.8	13.6	--------	50	3.4	3.9	87.2	5.3	2.8	52.8
(8)	(8)	(8)	(4)	(8)	(8)	(4)	(8)	(8)	(8)	(8)	(8)	(8)	(8)
--------	117.60	10,550	44.9	55.2	105.5	--------	--------	27.78	30.4	--------	41.0	19.9	--------
80.6	14.70	1,319	11.22	6.90	13.19	85.8	52.3	3.47	3.80	91.4	5.12	2.49	48.5
76.5	13.90	1,220	11.1	6.4	12.8	83	48.8	3.35	3.7	85.9	5	2.1	42
84.5	15.17	1,485	11.5	7.3	13.6	88.5	56.2	3.7	3.9	97.3	5.3	2.8	53.8

North Dakota Mound Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
78.4	15.50	1,470	--------	7.3	13.8	--------	52.9	3.38	4.0	84.5	5.7	2.4	42.1
79.1	15.17	1,520	10.9	7.0	14.5	75.2	48.3	3.8	4.0	95	5.4	2.7	50
83.6	15.27	1,500	--------	7.6	14.7	--------	51.7	3.55	3.98	89.2	5.7	2.8	49.1
--------	--------	--------	--------	6.9	13.4	--------	51.5	3.3	3.7	89.2	5.4	--------	--------
76.3	14.97	1,345	--------	7.1	13.5	--------	52.6	3.6	4.15	86.8	5.3	2.9	54.7
79.1	14.93	1,375	12	7.3	--------	--------	--------	--------	--------	--------	5.65	2.6	46.0
--------	--------	1,470	--------	7.5	--------	--------	--------	3.5	4.0	87.5	5.8	--------	--------
84	15.33	1,525	--------	--------	--------	--------	--------	3.6	3.9	92.3	5.7	2.2	38.6
85.9	15.53	1,625	--------	7.1	--------	--------	--------	3.35	3.75	89.3	5.2	2.7	51.9
81.6	14.83	--------	--------	--------	13.6	--------	--------	--------	--------	--------	--------	--------	--------
83.1	14.77	1,455	--------	--------	13.7	--------	--------	3.7	3.8	97.4	5.8	2.5	43.1
80.2	15.83	1,620	--------	7.7	15.0	--------	51.3	3.7	3.95	93.7	5.4	2.7	50
--------	--------	--------	--------	7.2	--------	--------	--------	--------	--------	--------	5.4	--------	--------
--------	--------	--------	--------	7.0	--------	--------	--------	3.4	3.85	88.3	5.3	2.5	47.2
--------	--------	--------	13.1	7.9	--------	--------	--------	--------	--------	--------	5.3	2.3	43.4
(10)	(10)	(10)	(3)	(12)	(8)	--------	(6)	(11)	(11)	(11)	(14)	(11)	(11)
--------	152.13	14,905	36.0	87.6	112.2	--------	--------	38.88	43.08	--------	77.05	28.30	--------
81.0	15.21	1,490	12.0	7.3	14.03	--------	51.4	3.54	3.92	90.2	5.50	2.57	46.8
76.3	14.77	1,345	10.9	6.9	13.4	--------	48.3	3.3	3.9	84.5	5.2	2.2	38.6
85.9	15.83	1,625	13.1	7.9	15.0	--------	52.9	3.8	4.0	97.4	5.8	2.9	54.7

North Dakota Mound Indian crania—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243, 233	U. S. N. M.	Fort Totten, N. Dak.	Adult		17.9	13.9	12.8	*77.6*
243, 236	do	Devils Lake Agency.	do		17.4	13.6	12.0	*78.2*
228, 889	do	Walsh County, N. Dak.	do		17.1	13.6	13.3	*79.5*
228, 886	do	do	do	Very slight occ. comp.	17.8	14.3	12.8	*80.3*
243, 234	do	Fort Totten, N. Dak.	do					
Totals					(4) 70.2	(4) 55.4	(4) 50.9	(4)
Averages					*17.55*	*13.85*	*12.72*	*78.9*
Minima					17.1	13.6	12.0	*77.6*
Maxima					17.9	14.3	13.3	*80.3*

South Dakota Mound Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243, 222	U. S. N. M.	Fort Wadsworth, S. Dak.	Adult		19.0	13.6	13.4	*71.6*
225, 240	do	do	do		18.9	13.6	13.8	*72*
225, 254	do	do	do		18.6	13.6	13.7	*73.1*
243, 223	do	do	do		18.5	13.9	13.4	*75.1*
243, 221	do	do	do		18.6	14.4	13.4	*77.4*
Totals					(5) 93.6	(5) 69.1	(5) 67.7	(5)
Averages					*18.72*	*13.82*	*13.54*	*73.8*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243, 219	U. S. N. M.	Fort Wadsworth	Adult		17.2	13.5	12.2	*78.5*
243, 224	do	do	do		18		12.4	
Totals					(2) 35.2		(2) 24.6	
Averages					*17.6*		*12.3*	

North Dakota Mound Indian crania—Continued

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
80.5	14.87	1,465	-------	6.5	12.9	-------	*50.4*	3.3	3.7	*89.2*	4.7	2.4	*51.1*
77.4	14.33	1,225	-------	7.0	12.9	-------	*54.3*	3.5	3.7	*94.6*	4.9	2.3	*46.9*
86.7	14.67	1,310	-------	6.9	13.2	-------	*52.3*	3.35	3.85	*87.0*	5.0	2.4	*48.0*
79.8	14.97	-------	11.2	7.2	-------		-------	-------	-------	-------	5.15	2.6	*50.5*
-------	-------	-------	-------	6.7	12.9	-------	*51.9*	3.6	3.7	97.3	5.1	2.3	*45.1*
(*4*)	(4)	(3)	-------	(5)	(4)	-------	(*4*)	(4)	(4)	(*4*)	(5)	(5)	(*5*)
-------	58.84	4,000	-------	34.3	51.9	-------	-------	13.75	14.95	-------	24.85	12.0	-------
81.1	*14.71*	*1,333*	-------	*6.86*	*12.98*	-------	*52.2*	*3.44*	*3.74*	*92*	*4.97*	*2.4*	*48.3*
77.4	14.33	1,225	-------	6.5	12.9	-------	*50.4*	3.3	3.7	*82*	4.7	2.3	*45.1*
86.7	14.97	1,465	-------	7.2	13.2	-------	*54.3*	3.6	3.85	*97.3*	5.15	2.6	*51.1*

South Dakota Mound Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breath, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
82.2	15.33	1,450	11.6	7.1	14.0	*82.9*	*50.7*	3.4	3.65	*93.2*	5.1	2.4	*47.1*
84.9	15.43	1,475	12.3	7.6	14.0	*87.9*	*54.3*	3.3	3.8	*86.8*	5.5	2.8	*50.9*
85.1	15.30	1,420	-------	7.2	14.3	-------	*50.4*	3.35	4.0	*83.8*	5.5	-------	-------
82.7	15.27	1,525	-------	7.6	13.8	-------	*55.1*	3.5	3.92	*89.3*	5.5	2.6	*47.3*
81.2	15.47	1,590	-------	-------	14.0	-------	-------	3.5	3.72	*94.1*	5.2	2.4	*46.2*
(*5*)	(5)	(5)	(2)	(4)	(5)	(*2*)	(*4*)	(5)	(5)	(*5*)	(5)	(4)	(*4*)
-------	76.80	7,460	23.9	29.5	70.1	-------	-------	17.05	19.09	-------	26.8	10.2	-------
83.2	*15.36*	*1,492*	*11.95*	*7.38*	*14.02*	*85.4*	*52.6*	*3.41*	*3.82*	*89.3*	*5.36*	*2.55*	*47.9*

FEMALE

79.5	14.30	1,220	11.8	7.1	12.9	*91.5*	*55*	3.5	3.8	*92.1*	5.1	2.5	*49*
-------	-------	-------	-------	6.8	-------	-------	-------	-------	-------	-------	4.8	2.5	*52.1*
-------	-------	-------	-------	(*2*)	-------	-------	-------	-------	-------	-------	(2)	(2)	(*2*)
-------	-------	-------	-------	13.9	-------	-------	-------	-------	-------	-------	9.9	5	-------
-------	-------	-------	-------	*6.95*	-------	-------	-------	-------	-------	-------	*4.95*	*2.5*	*50.5*

Hidatsa Indian crania: Minnetaree (Gros Ventre of the Missouri)

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
244,099	U. S. N. M.	Big Heart River, S. Dak.	Adult		19.4	13.8	13.2	*71.1*
243,386	do	North Dakota	do		18.4	13.4	13.3	*72.8*
225,082	do	Big Heart River, S. Dak.	do		19.3	14.1	13.4	*73.1*
243,761	do	do	do	Slight frontal flattening.	19.1	14.0	13.3	*73.3*
243,392	do	Fort Berthold, N. Dak.	do		18.8	13.8	13.5	*73.4*
243,751	do	Big Heart River, S. Dak.	do		19.2	14.3	13.6	*74.5*
225,144	do	Big Heart River, Nebr.	do		18.4	14.3	13.3	*77.7*
					(7)	(7)	(7)	(7)
Totals					132.6	97.70	93.60	
Average					*18.94*	*13.96*	*13.37*	*73.7*
Minima					18.4	13.4	13.2	*71.1*
Maxima					19.4	14.3	13.6	*77.7*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,750	U. S. N. M.	Big Heart River, S. Dak.	Adult		17.6	13.2	Low.	*75.0*
243,742	do	do	do		18.3	13.9	13.4	*76.0*
243,393	do	Fort Berthold, N. Dak.	do		17.4	13.3	12.6	*76.4*
243,756	do	Big Heart River, S. Dak.	do		18.0	13.8	12.8	*76.7*
243,741	do	do	do		17.4	13.4	12.6	*77.0*
243,754	do	do	do		17.6	13.6	Medium.	*77.3*
243,743	do	do	do		18.1	14.0	12.9	*77.4*
[1]243,753	do	do	do		(17.2)	(13.7)	(13.6)	*(79.6)*
243,752	do	do	do		17.3	13.8		*79.8*
243,739	do	do	do		17.5	14.2	13.3	*81.1*
243,758	do	do	do		17.6			
					(10)	(9)	(6)	(9)
Totals					176.8	123.2	77.6	
Averages					*17.68*	*13.69*	*12.92*	*77.4*
Minima					17.3	13.2	12.6	*75.0*
Maxima					18.3	14.2	13.4	*81.1*

[1] Part broken or damaged; measurement approximate.

Hidatsa Indian crania: Minnetaree (Gros Ventre of the Missouri)

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
79.5	15.47	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
83.6	15.03	1,320	-------	6.9	13.2	-------	*52.3*	3.15	3.9	*80.8*	5.45	3.1	*56.9*
80.2	15.60	1,510	-------	8.5	13.9	-------	*61.2*	4.25	4.35	*97.7*	6.0	3.0	*50*
80.4	15.47	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
80.4	15.37	1,350	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
81.2	15.70	1,575	-------	7.1	13.7	-------	*51.8*	-------	-------	-------	5.2	2.4	*46.2*
81.4	15.33	1,520	-------	7.8	13.9	-------	*56.1*	3.7	3.75	*98.7*	5.8	2.6	*44.8*
(7)	(7)	(5)	-------	(4)	(4)	-------	*(4)*	(3)	(3)	*(3)*	(4)	(4)	*(4)*
-------	107.97	7,275	-------	30.3	54.7	-------	-------	11.10	12.00	-------	22.45	11.10	-------
81.3	*15.42*	*1,455*	-------	*7.56*	*13.68*	-------	*55.4*	*3.70*	*4.00*	*92.5*	*5.61*	*2.78*	*49.4*
79.5	15.03	1,320	-------	6.9	13.2	-------	*51.8*	3.15	3.75	*80.8*	5.2	2.4	*44.8*
83.6	15.70	1,575	-------	8.5	13.9	-------	*61.2*	4.25	4.35	*98.7*	6.0	3.1	*56.9*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total*	*Facial Index, upper*	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
-------	-------	1,180	-------	-------	-------	-------	-------	-------	-------	-------	5.4	2.6	*48.2*
83.2	15.20	1,460	-------	7.3	-------	-------	-------	3.9	3.9	*100*	5.3	2.6	*49.1*
82.1	14.43	1,200	-------	-------	-------	-------	-------	-------	-------	-------	5.0	-------	-------
80.5	14.87	1,325	-------			-------	-------	3.4	3.8	*89.5*	5.0	2.6	*52*
81.8	14.47	1,340	-------	6.6	[1] 13.1	-------	*50.4*	3.5	3.7	*94.6*	5.3	2.4	*45.3*
-------	-------	1,360	-------	6.7	[1] 13.2	-------	*50.8*	-------	-------	-------	5.3	2.6	*49.1*
80.4	15.00	1,345	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
(88.0)	14.83	1,350	-------	6.7	[1] 13.6	-------	*49.3*	3.5	3.6	*97.2*	5.0	2.5	*50*
			-------	7.0	[1] 13.3	-------	*52.6*	3.9	4.05	*96.3*	5.4	-------	-------
84.0	15.00	1,430	-------	6.9	-------	-------	-------	3.7	3.8	*97.4*	5.4	2.6	*48.2*
-------	-------	-------	-------	6.8	-------	-------	-------	3.5	3.9	*89.7*	5.0	2.5	*50*
(6)	(6)	(9)	-------	(7)	(4)	-------	*(4)*	(7)	(7)	*(7)*	(10)	(8)	*(8)*
-------	88.97	11,990	-------	48.0	53.2	-------	-------	25.4	26.75	-------	52.1	20.4	-------
81.9	*14.83*	*1,332*	-------	*6.86*	*13.30*	-------	*50.9*	*3.63*	*3.82*	*95*	*5.21*	*2.55*	*48.9*
80.4	14.43	1,180	-------	6.6	13.1	-------	*49.3*	3.4	3.6	*89.5*	5.0	2.4	*45.3*
84.0	15.20	1,460	-------	7.3	13.6	-------	*52.6*	3.9	4.05	*100.0*	5.4	2.6	*52.0*

[1] Some crest along coronal suture with marked bulge at bregma.

Osage Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243, 580	U. S. N. M.	Washita River, Okla.	Adult		17.9	14.5	13.6	*81*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243, 582	U. S. N. M.	Cherokeetown, Okla.	Adult		16.4	12.9	12.4	*78.7*
243, 573	do	do	do		16.4	14.0	13.3	*85.4*
243, 571	do	Wichita River, Okla.	do		16.0	14.0	13.0	*87.5*
Total					(3) 48.8	(3) 40.9	(3) 38.7	(3)
Average					*16.27*	*13.63*	*12.90*	*83.8*

Sioux and Sioux type Indian crania—Miscellaneous

FEMALE

ASSINIBOIN

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243, 388	U. S. N. M.	Fort Buford Indian Reservation.	Adult		18	14.3	12.1	*79.4*

SANTEE SIOUX

243, 719	U. S. N. M.	Fort Robinson, Nebr.	Adult		17.6	13.4	12.6	*76.1*

WAHPETON SIOUX

243, 371	U. S. N. M.	Fort Sisseton, S. Dak.	Adult		18.3	13.3	13.2	*72.7*

KANSAS

243, 261	U. S. N. M.	Fort Harker	Adult		18.2	14	12.9	*76.9*

Osage Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
84	15.33	1,440	-------	7.1	13.8	-------	*51.4*	3.35	3.8	*88.2*	5.2	2.5	*48.1*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
84.6	13.90	1,115	-------	6.5	-------	-------	-------	3.5	3.7	*94.6*	5.05	2.6	*51.5*
87.5	14.57	1,320	11.7	7.3	12.8	*91.4*	*57.0*	3.6	3.75	*96.0*	5.0	2.6	*52*
86.7	14.33	1,250	11.1	7.1	13.2	*84.1*	*53.8*	3.42	3.72	*91.9*	5.2	2.4	*46.2*
(3)	(3) 42.8	(3) 3,685	(2) 22.8	(3) 20.9	(2) 26.0	(2) -------	(2) -------	(3) 10.52	(3) 11.17	(3) -------	(3) 15.25	(3) 7.6	(3) -------
86.3	*14.27*	*1,228*	*11.4*	*6.97*	*13.00*	*87.7*	*55.4*	*3.51*	*3.72*	*94.2*	*5.08*	*2.53*	*49.8*

Sioux and Sioux type Indian crania—Miscellaneous

FEMALE

ASSINIBOIN

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
74.9	14.80	1,340	-------	6.8	13.2	-------	*51.5*	3.4	3.75	*90.7*	4.9	2.8	*57.1*

SANTEE SIOUX

81.3	14.53	1,230	10.3	6.1	13.3	*77.4*	*45.9*	3.22	3.95	*81.7*	4.75	2.5	*52.6*

WAHPETON SIOUX

83.5	14.93	1,360	12	7.4	12.6	*95.2*	*58.7*	3.68	3.7	*99.3*	5.3	2.4	*45.3*

KANSAS

80.1	15.03	1,305	-------	6.8	-------	-------	-------	3.32	4	*83*	4.95	2.6	*52.5*

Oklahoma Indian crania, approaching Siouan type

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,578	U. S. N. M.	Commission Creek.	Adult		18.4	14	13.3	*76.1*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,574	U. S. N. M.	Camp Supply	Adult		17.4	13.5	12.6	*77.6*
'9	do	do	do		17.2	13.7	12.7	*79.6*

The Siouan tribes: Summary of measurements

MALE

	Sioux proper						
	Miscellaneous	Teton	Brulé	Oglala	Sisseton	Yankton	Montana
Number of skulls	(17)	(4)	(15)	(14)	(4)	(5)	(4)
Vault:							
Length	18.75	18.48	18.55	18.61	18.45	17.92	18.48
Breadth	14.75	14.35	14.43	14.51	14.02	13.94	14.73
Height	13.08	12.75	13.06	12.99	13.02	12.98	12.83
Cranial Index	*76.5*	*77.7*	*77.8*	*78*	*76*	*77.8*	*79.7*
Mean Height Index	*78.9*	*77.7*	*79.2*	*78.5*	*80.2*	*81.5*	*77.3*
Module	15.41	15.19	15.31	15.37	15.17	14.94	15.34
Capacity	1,490	1,481	1,527	1,511	1,394	1,392	1,449
Face:							
M.-N. Height	12.73		12.6	12.08	12.03	12.12	12.8
Alv. Pt.-N. Height	7.70	7.2	7.68	7.58	7.25	7.62	7.8
Breadth	14.35	14.52	14.23	14.41	13.75	14.18	14.5
Facial Index, total	*89.4*		*88.5*	*84.2*	*86.6*	*85.5*	*88*
Facial Index, upper	*54.1*	*49.6*	*54*	*52.7*	*52.7*	*53.7*	*54*
Orbits:							
Mean Height	3.68	3.68	3.61	3.63	3.49	3.59	3.56
Mean Breadth	3.98	4.07	3.99	4.06	3.85	3.95	4.02
Mean Index	*92.4*	*90.3*	*90.7*	*89.5*	*90.6*	*90.9*	*88.5*
Nose:							
Height	5.52	5.4	5.49	5.54	5.4	5.45	5.68
Breadth	2.67	2.75	2.64	2.78	2.61	2.69	2.55
Index	*48.5*	*50.9*	*48.1*	*50.3*	*48.4*	*49.4*	*44.9*

Oklahoma Indian crania, approaching Siouan type

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
82.1	15.23	1,350	------	------	------	------	------	------	------	------	5.3	2.8	*52.8*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
81.6	14.50	1,270	------	6.1	13	------	*46.9*	3.5	3.9	*89.7*	4.5	2.7	*60*
82.2	14.53	1,270	------	------	------	------	------	------	------	------	------	------	------

The Siouan tribes: Summary of measurements

MALE

Nearly related tribes				Related tribes			Related only by language
Mandan	Crow	Arikara	Ponka	North Dakota Mounds	South Dakota Mounds	Hidatsa	Osage
(2)	(2)	(53)	(11)	(14)	(5)	(7)	(1)
18.2	17.75	18.28	18.21	18.59	18.72	18.94	17.9
13.9	13.75	14.25	14.44	13.92	13.82	13.96	14.5
13.3	12.75	13.46	13.25	13.17	13.54	13.37	13.6
76.4	*77.5*	*77.9*	*79.3*	*75.2*	*73.8*	*73.7*	*81*
82.9	*81*	*82.7*	*81.2*	*81*	*83.2*	*81.3*	*84*
15.14	14.75	15.33	15.29	15.21	15.36	15.42	15.33
1,485	1,290	1,485	1,490	1,490	1,492	1,455	1,440
------	11.6	12.21	12.06	12	11.95	------	------
7.6	7.3	7.60	7.54	7.3	7.38	7.56	7.1
------	13.25	14.15	14.15	14.03	14.02	13.68	13.8
------	*87.5*	*86.1*	*85.2*	------	*85.4*	------	------
------	*55.1*	*53.7*	*53.3*	*51.4*	*52.6*	*55.4*	*51.4*
3.67	3.49	3.64	3.48	3.54	3.41	3.70	3.35
3.78	3.9	3.99	3.91	3.92	3.82	4	3.8
97.1	*89.5*	*90.9*	*89*	*90.2*	*89.3*	*92.5*	*88.2*
5.55	5.27	5.56	5.38	5.50	5.36	5.61	5.2
2.55	2.82	2.62	2.66	2.57	2.55	2.78	2.5
45.9	*53.6*	*47.1*	*49.8*	*46.8*	*47.9*	*49.4*	*48.1*

The Siouan tribes: Summary of measurements—Continued

FEMALE

	Sioux proper						
	Miscellaneous	Teton	Brulé	Oglala	Sisseton	Yankton	Montana
Number of skulls	(14)	(3)	(10)	(7)	(3)	(3)	(3)
Vault:							
Length	17.88	17.9	17.72	17.84	17.23	17.53	17.6
Breadth	13.71	13.93	13.81	13.91	13.63	13.97	14.13
Height	12.59	12.7	12.38	12.56	12.37	13.03	12.93
Cranial Index	*76.7*	*77.8*	*77.9*	*78*	*79.2*	*79.6*	*80.3*
Mean Height Index	*79.7*	*79.8*	*77.9*	*79.1*	*80.1*	*82.7*	*81.5*
Module	14.73	14.84	14.64	14.77	14.41	14.84	14.89
Capacity	1,334	1,427	1,352	1,336	1,258	1,417	1,308
Face:							
M.-N. Height	11.4	11.5	11.64	11.33	----------	11.27	----------
Alv. Pt.-N. Height	7.08	7.13	7.24	6.96	7.1	7.03	6.95
Breadth	13.32	13	13.38	13.43	12.83	13.23	----------
Facial Index, total	*85.6*	*88*	*87*	*85*	----------	*85.1*	----------
Facial Index, upper	*53.1*	*54.9*	*54.1*	*52.1*	*55.3*	*53.2*	----------
Orbits:							
Mean Height	3.59	3.63	3.62	3.51	3.45	3.47	3.48
Mean Breadth	3.88	3.88	3.87	3.92	3.63	3.86	3.85
Mean Index	*92.4*	*93.6*	*93.5*	*89.7*	*95*	*89.7*	*90.4*
Nose:							
Height	5.24	5.07	5.22	5.12	5.27	5.13	5.07
Breadth	2.53	2.5	2.5	2.58	2.6	2.73	----------
Index	*48.5*	*49.4*	*48*	*50.4*	*49*	*53.2*	----------

NOTES ON THE SIOUX

The skulls of the very interesting and important group of the Siouan tribes show the following basic conditions:

1. The Siouan family embraces somatologically (*a*) what may be termed the Sioux proper; (*b*) physically closely related tribes; (*c*) physically less closely related groups; and (*d*) tribes related only in language. As far as our data go, the tribes belonging to these several subdivisions are given in the preceding summary.

2. The Sioux type, one of the best differentiated of Indian types on the continent, is characterized by:

A skull of moderate to good size;
Mesocephaly;
A remarkable lowness of the vault;
Large face (and jaws);
Medium-high orbits; and
Mesorhynic nasal aperture.

3. The lowness of the vault is a highly distinctive feature, which in larger bodies of the North American natives north of Mexico is met with only among the Athapascan and related northwest coast tribes, and more distantly among the Mongols of Asia.

4. The Osage are plainly not Sioux, regardless of language and possibly some admixture. This conclusion is seconded by observations on the living.

The Siouan tribes: Summary of measurements—Continued

FEMALE

Nearly related tribes		Related tribes			Related only by language
Arikara	Ponka	North Dakota Mounds	South Dakota Mounds	Hidatsa	Osage
(45)	(8)	(4)	(2)	(10)	(3)
17.38	17.50	17.55	17.60	17.68	16.27
13.64	13.94	13.85		13.69	13.6
12.84	12.66	12.72	12.3	12.92	12.9
78.4	*79.6*	*78.9*		*77.4*	*83.8*
82.7	*80.6*	*81.1*		*81.9*	*86.3*
14.60	14.70	14.71		14.83	14.27
1,340	1,319	1,333		1,332	1,228
11.46	11.22				11.4
7.16	6.9	6.86	6.95	6.86	6.97
13.05	13.19	12.98		13.30	13
87.6	*85.8*				*87.7*
55	*52.3*	*52.2*		*50.9*	*55.4*
3.56	3.47	3.44		3.63	3.51
3.84	3.8	3.74		3.82	3.72
92.9	*9.14*	*92*		*95*	*94.2*
5.18	5.12	4.97	4.95	5.21	5.08
2.53	2.49	2.4	2.5	2.55	2.53
48.8	*48.5*	*48.3*	*50.5*	*48.9*	*49.8*

CADDOAN TRIBES

Pawnee Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
225,092	U. S. N. M.	Near Solomon River, Kans.	Adult		18	14.4	12.9	*80*
243,536	do	Fort Harker, Kans	do		18.4	15	12.7	*81.5*
243,537	do	do	do		17.6	14.6	12.5	*82.9*
					(3)	(3)	(3)	(3)
Totals					54	44	38.1	
Averages					*18*	*14.67*	*16.03*	*81.5*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
225,093	U. S. N. M.	Dakota Territory	Adult		17	13.9	12	*81.8*
243,795	do		do					
Totals								
Averages								

Caddo Indian crania

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,894	U. S. N. M.	Near mouth of Little Arkansas River.	Adult		16.6	14.1	13	*84.9*
243,895	do	do	do	Slight occipital flattening.	(15.7)	(14.4)	(11.9)	
Totals								
Averages								

CADDOAN TRIBES

Pawnee Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
79.6	15.10	1,510	11.8	7.2	13.8	*85.5*	*52.2*	3.6	3.9	*92.3*	5.3	2.55	*48.1*
76	15.37	-------	12.3	7.3	14.8	*83.1*	*49.3*	3.85	4.05	*95.1*	5.4	2.65	*49.1*
77.6	14.90	1,405	12	7.4	14	*85.7*	*52.9*	3.85	4	*96.2*	5.4	2.9	*53.7*
(3)	(3)	(2)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)	(3)
-------	45.37	2,915	36.1	21.9	42.6	-------	-------	11.3	11.95	-------	16.1	8.1	-------
77.8	*15.12*	*1,458*	*12.03*	*7.3*	*14.2*	*84.7*	*51.4*	*3.77*	*3.98*	*94.6*	*5.37*	*2.7*	*50.3*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total*	*Facial Index, upper*	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
77.7	14.30	1,210	-------	7.1	13.3	-------	*53.4*	3.45	3.85	*89.6*	5	2.55	*51*
-------	-------	-------	-------	-------	-------	-------	-------	3.37	3.55	*94.9*	4.95	2.8	*56.5*
-------	-------	-------	-------	-------	-------	-------	-------	(2)	(2)	(2)	(2)	(2)	(2)
-------	-------	-------	-------	-------	-------	-------	-------	6.82	7.4	-------	9.95	5.35	-------
-------	-------	-------	-------	-------	-------	-------	-------	3.41	3.7	92.2	4.98	2.68	53.8

Caddo Indian crania

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
84.7	14.57	1,300	-------	7	13.1	-------	*53.4*	3.25	3.65	*89*	4.95	2.6	*52.5*
-------	14.00	1,240	-------	6.5	13	-------	*50*	3.50	3.65	*95.9*	4.95	2.5	*50.5*
	(2)	(2)	-------	(2)	(2)	-------	(2)	(2)	(2)	(2)	(2)	(2)	(2)
-------	28.57	2,540	-------	13.5	26.1	-------	-------	6.75	7.3	-------	9.9	5.1	-------
-------	*14.28*	*1,270*	-------	*6.75*	*13.05*	-------	*51.7*	*3.37*	*3.65*	*92.5*	*4.95*	*2.55*	*51.5*

Wichita Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243, 563	U. S. N. M.	Mouth of Little Arkansas River, Kans.	Adult	Very slight occipital flattening.	17.7	14.6	13.4	*82.5*
243, 581	do	Little Arkansas River, Kans.	do	Slight posterior compression.	(17.2)	(14.2)	(13.6)	(*82.6*)
243, 557	do	do	Near senile.	Slight asymmetry.	(17.8)	(15.2)	(13.3)	(*85.4*)
Totals								
Averages								

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243, 560	U. S. N. M.	Little Arkansas River, Kans.	Adult	Very slight occipital flattening.	16.6	14.4	12.8	*86.8*
243, 558	do	do	do	Moderate occipital flattening.	(16.6)	(14.0)	(12.6)	(*84.3*)
243, 561	do	do	do	Slight occipital flattening.	(16.4)	(14.2)	(13.3)	(*86.6*)
243, 559	do	do	do	Moderate occipital flattening.	(15.8)	(14.1)	(13.0)	(*89.2*)
243, 572	do	do	do	Slight occipital flattening.	(15.7)	(14.5)	(12.2)	(*92.4*)
Totals								
Averages								

Wichita Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
83	15.23	1,350	-------	8	14	--------	57.1	3.72	4	93	5.6	2.3	41.1
(86.6)	15.00	1,330	-------	7.4	13.8	--------	53.6	3.37	3.95	85.3	5.15	2.7	52.4
(80.6)	15.43	1,380	-------	-------	14.2	--------	-------	3.80	4.25	89.4	5.6	2.9	51.8
 -------- --------	(3) 45.66 15.22	(3) 4,060 1,353	------- ------- -------	(2) 15.4 7.7	(3) 42 14	-------- -------- --------	(2) ------- 55.4	(3) 10.89 3.63	(3) 12.20 4.07	(3) -------- 89.3	(3) 16.35 5.45	(3) 7.90 2.63	(3) ------- 48.3

FEMALE

82.6	14.60	1,260	10.7	6.6	13.2	81.1	50	3.50	3.85	90.9	4.80	2.30	47.9
(82.4)	14.40	1,260	11.1	6.8	13	85.4	52.3	3.80	3.70	102.7	4.80	2.55	53.1
(86.9)	14.63	1,280	-------	7.3	13	--------	56.2	3.37	3.90	86.4	5.35	2.40	44.9
(87)	14.30	1,250	10.4	6.3	12.5	83.2	50.4	3.40	3.60	94.4	4.70	2.40	51.1
(80.8)	14.13	1,275	11.5	7.1	12.8	89.8	55.5	3.65	3.70	98.6	5.10	2.30	45.1
 -------- --------	(5) 72.06 14.41	(5) 6,325 1,265	(4) 43.70 10.92	(5) 34.10 6.82	(5) 64.50 12.90	(4) -------- 84.6	(5) ------- 52.9	(5) 17.72 3.54	(5) 18.75 3.75	(5) -------- 94.4	(5) 24.75 4.95	(5) 11.95 2.39	(5) ------- 48.3

Caddoan crania: Summary of measurements

	Male		Female	
	Pawnee	Wichita	Caddo	Wichita
Number of skulls	(3)	(3)	(2)	(5)
Vault:				
Length	18	[1] 17.7	[1] 16.6	[1] 16.6
Breadth	14.67	[1] 14.6	[1] 14.1	[1] 14.4
Height	16.03	[1] 13.4	[1] 13	[1] 12.8
Cranial Index	*81.5*	[1] *82.5*	[1] *84.9*	[1] *86.8*
Mean Height Index	*77.8*	[1] *83*	[1] *84.7*	[1] *82.6*
Module	15.12	15.22	14.28	14.41
Capacity	1,458	1,353	1,270	1,265
Face:				
M.-N. Height	12.03			10.92
Alv. Pt.-N. Height	7.3	7.7	6.75	6.82
Breadth	14.2	14	13.05	12.9
Facial Index, total	*84.7*			*84.6*
Facial Index, upper	*51.4*	*55.4*	*51.7*	*52.9*
Orbits:				
Mean Height	3.77	3.63	3.37	3.54
Mean Breadth	3.98	4.07	3.65	3.75
Mean Index	*94.6*	*89.3*	*92.5*	*94.4*
Nose:				
Height	5.37	5.45	4.95	4.95
Breadth	2.7	2.63	2.55	2.39
Index	*50.3*	*48.3*	*51.5*	*48.3*

[1] One skull.

NOTES ON THE CADDOAN TRIBES

1. Collections from these tribes are very inadequate.

2. The three tribes represented by undeformed specimens show such differences that they can not be attributed to one physical type.

3. The Pawnee, while subbrachycephalic, show a decidedly low vault which approaches them closely to the Sioux.

4. The Caddo and Wichita are brachycephals with medium high vault.

5. The face, orbits, and nose show, as far as this series goes, nothing especially characteristic.

SALISH AND SAHAPTIN

Vancouver Island Indian crania [1]

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
228,454	U. S. N. M	Northwest coast of the island.	Adult		17.5	13.6	13.2	*77.7*

[1] Crania from this island are generally artificially deformed and unfit for measurement.

Nez Percé Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,672	U. S. N. M	Fort Ellis	Adult		18.8	14.7	14.4	*78.2*
243,671	do	do	do		18.1	14.5	13.8	*80.1*
243,838	do	Fort Lapwai	do	Moderate occipital compression.	(17)	(15)	(12.8)	
					(2)	(2)	(2)	(2)
Totals					36.9	29.2	28.2	
Averages					*18.45*	*14.60*	*14.10*	*79.1*

State of Washington Indian crania [1]

MALE

"SPOKANE" INDIAN

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,447	U. S. N. M	Washington	Adult		18.6	15	13	*80.6*

FEMALE

"CHEHALIS" INDIAN

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,397	U. S. N. M	Grays Harbor, Wash.	Adult		17.1	14.4	12.8	*84.2*

[1] A large majority of the crania from this State are artificially deformed and unfit for measurement.

SALISH AND SAHAPTIN

Vancouver Island Indian crania

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper,* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
84.9	14.77	1,340	-------	7	13.2	-------	*53*	3.7	4.05	*91.4*	5	2.7	*54*

Nez Percé Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose Breadth, maxim.	*Nasal Index*
86	15.97	1,635	13	-------	14.6	*89*	-------	4.15	4.2	*98.8*	5.85	2.5	*42.7*
84.7	15.47	1,520	11.9	7.4	14.6	*81.5*	*50.7*	3.65	4	*91.2*	5.3	2.4	*45.3*
-------	14.93	1,520	-------	8.2	14.7	-------	*55.8*	3.85	4.15	*92.8*	6	2.5	*41.7*
(2)	(3)	(3)	(2)	(2)	(2)	(2)	(2)	(3)	(3)	(3)	(3)	(3)	(3)
-------	46.37	4,675	24.9	15.6	43.9	-------	-------	11.65	12.35	-------	17.15	7.4	-------
85.3	*15.46*	*1,558*	*12.45*	*7.8*	*14.63*	*85.3*	*53.2*	*3.88*	*4.12*	*94.3*	*5.72*	*2.47*	*43.1*

State of Washington Indian crania

MALE

"SPOKANE" INDIAN

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
77.4	15.53	1,570	13	7.8	14.7	*88.4*	*53.1*	3.9	3.9	*100*	5.4	2.6	*48.1*

FEMALE

"CHEHALIS" INDIAN

81.3	14.77	1,310	-------	-------	13.4	-------	-------	3.55	3.6	*98.6*	4.3	2.4	*55.8*

Oregon Indian crania [1]

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,601	U. S. N. M.	Chetco, Oreg.	Adult		18.6	14.6	13.3	*78.5*
243,922	do	Pistol River	do		18.6	[2] 14.6	13.9	*78.5*
243,602	do	do	do		18.6	14.7	13.4	*79.0*
243,605	do	do	do		17.9	14.8	13.6	*82.7*
					(4)	(4)	(4)	(4)
Totals					73.7	58.7	54.2	
Averages					*18.42*	*14.68*	*13.55*	*79.6*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,603	U. S. N. M.	Big Lagoon	Adult		17.4	13.4	12.3	*77.0*
243,600	do	Rogue River	do		16.6	12.8	12.6	*77.1*
243,604	do	Dallas, Polk County.	do		17.6	13.8	13.0	*78.4*
243,596	do	Steins Mountain	do		17.5	14.4	12.2	*82.3*
243,599	do	Chetco	do		17.1	14.2	12.8	*83.0*
					(5)	(5)	(5)	(5)
Totals					86.2	68.6	62.9	
Averages					*17.24*	*13.72*	*12.58*	*79.6*

[1] A number of other specimens from Oregon are more or less artificially deformed and unfit for measurement.

Oregon Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
80.1	15.50	1,530	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
83.7	15.70	-------	-------	7.7	-------	-------	-------	3.75	3.9	*96.2*	5.65	2.25	*39.8*
80.5	15.57	-------	-------	7.7	-------	-------	-------	3.65	4	*91.2*	5.4	2.3	*42.6*
83.2	15.43	1,555	-------	7.1	-------	-------	-------	-------	-------	-------	5.15	2.2	*42.7*
(4)	(4)	(2)	-------	(3)	-------	-------	-------	(2)	(2)	(2)	(3)	(3)	(3)
-------	62.2	3,085	-------	22.5	-------	-------	-------	7.4	7.9	-------	16.2	67.5	-------
81.9	*15.55*	*1,542*	-------	*7.5*	-------	-------	-------	*3.7*	*3.95*	*93.7*	*5.4*	*2.25*	*41.7*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
79.9	14.37	1,170	10.8	6.9	12.7	*85.0*	*54.3*	3.32	3.40	*97.7*	4.7	2.4	*51.1*
85.7	14.00	1,150	10.8	6.5	13.1	*82.4*	*49.6*	3.40	3.90	*87.2*	4.6	2.3	*50*
82.8	14.80	1,180	-------	-------	13.1	-------	-------	3.35	3.80	*88.2*	5.0	2.4	*48*
76.5	14.70	1,260	-------	7.0	13.5	-------	*51.8*	3.68	3.95	*93.2.*	4.9	2.6	*53.1*
81.8	14.70	1,290	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
(5)	(5)	(5)	(2)	(3)	(4)	(2)	(3)	(4)	(4)	(4)	(4)	(4)	(4)
-------	72.57	6,050	21.6	20.4	52.4	-------	-------	13.75	15.05	-------	19.2	9.7	-------
81.3	*14.51*	*1,210*	*10.8*	*6.8*	*13.1*	*83.7*	*51.9*	*3.44*	*3.76*	*91.4*	*4.8*	*2.42*	*50.5*

[1] Right side damaged, measurement approximate.

Sahaptin and Salish: Summary of measurements

	Male			Female		
	Nez Percé	"Spokane" (Washington State)	Oregon	Vancouver Island	"Chehalis" (Washington State	Oregon
Number of skulls	(3)	(1)	(4)	(1)	(1)	(5)
Vault:						
Length	18.45	18.6	18.42	17.5	17.1	17.24
Breadth	14.60	15	14.68	13.6	14.4	13.72
Height	14.10	13	13.55	13.2	12.8	12.58
Cranial Index	*79.1*	*80.6*	*79.6*	*77.7*	*84.2*	*79.6*
Mean Height Index	*85.3*	*77.4*	*81.9*	*84.9*	*81.3*	*81.3*
Module	15.46	15.53	15.55	14.77	14.77	14.51
Capacity	1,558	1,570	1,542	1,340	1,310	1,210
Face:						
N.-N. Height	12.45	13	----------	----------	----------	10.8
Alv. Pt.-N. Height	7.8	7.8	7.50	7	----------	6.8
Breadth	14.63	14.7	----------	13.2	13.4	13.1
Facial Index, total	*85.3*	*88.4*	----------	----------	----------	*83.7*
Facial Index, upper	*53.2*	*53.1*	----------	*53*	----------	*51.9*
Orbits:						
Mean Height	3.88	3.9	3.7	3.7	3.55	3.44
Mean Breadth	4.12	3.9	3.95	4.05	3.6	3.76
Mean Index	*94.3*	*100*	*93.7*	*91.4*	*98.6*	*91.4*
Nose:						
Height	5.72	5.4	5.4	5	4.3	4.8
Breadth	2.47	2.6	2.25	2.7	2.4	2.42
Index	*43.1*	*48.1*	*41.7*	*54*	*55.8*	*50.5*

NOTES ON THE SAHAPTIN AND SALISH TRIBES

1. As far as represented, which is inadequately, these two families show in part a similarity of type. This type is characterized by:

High meso- to brachy-cephaly;

Good skull capacity;

Large and especially broad face;

Medium to high orbits;

Relatively narrow to medium nose.

2. The height of the vault is low in the one Spokane, who rather approaches the Shoshoni; medium to rather high in the other tribes.

3. The "Chehalis" belong apparently to a different type.

More material on these groups is a necessity.

SHOSHONEANS

Bannock Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,837	U. S. N. M.	South Idaho	Adult		18.2	13.4	13	*73.6*

Blackfeet (Siksika) Indian crania

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,669	U. S. N. M.	Montana	Adult		17.9	13.8	12.8	*77.1*
243,666	do	do	do		17.7	13.8		*78*
					(2)	(2)		*(2)*
Totals					35.6	27.6		
Averages					*17.8*	*13.8*		*77.5*

Piegan Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,673	U. S. N. M.	Fort Shaw, Mont.	Adult		19.3	14.1	13.0	*73.1*
243,675	do	do	do		18.3	13.6	13.4	*74.3*
243,676	do	do	do		18.4	13.7	13.2	*74.5*
243,680	do	do	do		18.8	14.0	13.8	*74.5*
243,684	do	do	do		18.4	13.8	12.4	*75*
243,682	do	do	do		18.6	14.0	14.1	*75.3*
243,646	do	Blackfeet Agency, Mont.	do		18.4	14.0	13.4	76.1
243,645	do	do	do		18.7	14.4	12.5	*77.0*
243,652	do	do	do		17.6	13.6	12.9	*77.3*
243,683	do	Fort Shaw, Mont.	do		18.0	14.1	13.4	*78.3*
243,644	do	Blackfeet Agency, Mont.	do		18.4	14.5	13.8	*78.8*
					(11)	(11)	(11)	*(11)*
Totals					202.9	153.8	145.9	
Averages					*18.44*	*13.98*	*13.26*	*75.8*
Minima					17.6	13.6	12.4	*73.1*
Maxima					19.3	14.5	14.1	*78.8*

SHOSHONEANS

Bannock Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
82.3	14.87	1,320	11.3	6.7	14.1	*80.1*	*47.5*	3.45	4	*86.2*	4.9	2.6	*53.1*

Blackfeet (Siksika) Indian crania

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
80.8	14.83	1,280	-------	7.4	13.1	-------	*56.5*	3.5	3.95	*88.6*	5.3	2.9	*54.7*
-------	-------	1,300	-------	7.3	13.4	-------	*54.5*	3.6	3.95	*91.2*	5.3	2.7	*50.9*
-------	-------	(2)	-------	(2)	(2)	-------	*(2)*	(2)	(2)	*(2)*	(2)	(2)	*(2)*
-------	-------	2,580	-------	14.7	26.5	-------	-------	7.1	7.9	-------	10.6	5.6	-------
-------	-------	*1,290*	-------	*7.35*	*13.25*	-------	*55.5*	*3.55*	*3.95*	*89.9*	*5.3*	*2.8*	*52.8*

Piegan Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
77.8	15.47	1,490	13.0	8.0	14.2	*91.6*	*56.3*	3.6	3.85	*93.5*	5.7	2.7	*47.4*
84.0	15.10	1,450	-------	7.7	14.3	-------	*53.8*	4.0	4.1	*97.6*	5.2	2.6	*50*
82.2	15.10	-------	-------	7.2	13.9	-------	*51.8*	3.5	3.95	*88.6*	5.0	2.6	52
84.2	15.53	1,530	-------	7.2	-------	-------	-------	3.55	3.75	*94.7*	5.2	2.4	*46.2*
77.0	14.87	1,315	-------					3.55	3.65	*97.3*			
86.5	15.57	1,570	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
82.7	15.27	1,430	-------	8.1	14.1	-------	*57.4*	3.7	4.0	*92.5*	5.6	2.6	*46.4*
75.5	15.20	1,450	-------	-------	14.2	-------	-------	3.6	3.8	*94.7*	5.5	2.6	*47.3*
82.7	14.70	1,260	-------	7.5	13.9	-------	*54*	3.3	4.05	*81.5*	5.4	2.6	*48.2*
83.5	15.17	1,465	-------	7.4	13.7	-------	*54.0*	3.5	3.8	*92.1*	5.5	2.6	*47.3*
83.9	15.57	1,580	-------	7.4	14.4	-------	*51.4*	3.5	4.05	*86.4*	5.7	2.7	*47.4*
(11)	(11)	(10)	-------	(8)	(8)	-------	*(7)*	(10)	(10)	*(10)*	(9)	(9)	*(9)*
-------	167.55	14,540	-------	60.5	112.7	-------	-------	35.8	39.0	-------	48.8	23.4	-------
81.8	*15.25*	*1,454*	-------	*7.56*	*14.09*	-------	*53.7*	*3.58*	*3.90*	*91.8*	*5.42*	*2.60*	*48*
75.5	14.70	1,260	-------	7.2	13.7	-------	*51.4*	3.3	3.65	*81.5*	5	2.4	*46.2*
86.5	15.57	1,580	-------	8.1	14.4	-------	*57.4*	4	4.1	*97.6*	5.7	2.7	*52*

Piegan Indian crania—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243, 650	U. S. N. M.	Blackfeet Agency, Piegan, Mont.	Adult		17. 9	13. 2	13. 1	*73. 7*
243, 651	do	do	do		18. 0	13. 8	13. 1	*76. 7*
243, 653	do	do	do		18. 2	14. 0	13. 2	*76. 9*
243, 679	do	Fort Shaw, Mont.	do		17. 4	13. 8	12. 4	*79. 3*
243, 686	do	do	do		17. 4	13. 8	12. 6	*79. 3*
243, 685	do	do	do		17. 2	13. 7	12. 3	*79. 6*
243, 677	do	do	do		17. 6	14. 0	12. 6	*79. 6*
243, 648	do	Blackfeet Agency, Mont.	do		17. 6	14. 0	12. 1	*79. 6*
243, 654	do	do	do		17. 5	14. 0	12. 2	*80*
243, 649	do	do	do		17. 4	14. 0	13. 2	*80. 5*
243, 674	do	Fort Shaw, Mont.	do		17. 4	14. 1	12. 8	*81. 0*
					(11)	(11)	(11)	*(11)*
Totals					193. 6	152. 4	139. 6	
Averages					*17. 60*	*13. 85*	*12. 69*	78. 7
Minima					17. 2	13. 2	12. 1	*73. 7*
Maxima					18. 2	14. 1	13. 2	*81*

Miscellaneous Shoshonean Indian crania: Unidentified as to tribe

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243, 303	U. S. N. M.	Nevada	Adult		17. 7	13	13. 4	*73. 4*
315, 645	do	Upper Kanab Creek, Utah.	Near senile.		18. 4	13. 6	13. 2	*73. 9*
243, 300	do	Nevada	Adult	Very slight occipital compression.	17. 5	13. 4	12. 4	*76. 6*
324, 346	do	Barber, Idaho	do		18. 2	14	13. 1	*76. 9*
243, 304	do	Nevada	do	Very slight asymmetry.	17. 9	13. 8		*77. 1*
243, 305	do	do	do		18. 1	14		*77. 4*
243, 839	do	Fort Boise, Idaho	do		17. 6	13. 8	12. 8	*78. 4*
243, 302	do	Nevada	do	Some posterior flattening.	(18. 4)	(14. 6)		*(79. 4)*
243, 817	do	Walker Lake, Nev.	do		18. 2		13	
288, 805	do	Beaver, Utah	do	Slight occipital flattening.	(17. 2)	(14. 2)	(12. 8)	*(82. 6)*
288, 804	do	do	do	Moderate occipital flattening.	(17)	(14. 8)	(13. 5)	*(87. 1)*
252, 915	do	Alkali Ridge, southeast Utah.	do	do	(17)	(14. 8)	(13. 6)	*(87. 1)*
292, 012	do	Paragonah, Iron County, Utah.	do	Marked occipital flattening.				
243, 943	do	Golden City, Colo.	do					
					(8)	(7)	(6)	(7)
Totals					143. 6	95. 6	77. 9	
Averages					*17. 95*	*13. 66*	*12. 98*	*76. 2*
Minima					17. 5	13	12. 4	*73. 4*
Maxima					18. 4	14	13. 4	*78. 4*

Piegan Indian crania—Continued

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
84.2	14.73	1,270	-------	7.2	12.9	--------	*55.8*	3.65	4.05	*90.1*	5.1	2.5	*49.0*
82.4	14.97	1,360	-------	6.7	12.5	--------	*53.6*	3.3	3.5	*94.3*	4.8	2.2	*45.8*
82	15.13	1,380	-------	-------	13.7	--------	--------	3.9	4.1	*95.1*	5.4	2.6	*48.2*
79.5	14.53	1,260	-------	6.5	12.9	--------	*50.4*	3.4	3.7	*91.9*	4.9	2.7	*55.1*
80.8	14.60	1,410	-------	7.3	13.3	--------	*54.9*	3.5	3.9	*89.7*	5.4	2.5	*46.3*
79.6	14.40	1,280	-------	7.3	13.3	--------	*54.9*	3.85	3.85	*100*	5.3	2.5	*47.2*
79.8	14.73	1,315	12.2	7.6	13.3	*91.7*	*57.1*	3.7	3.8	*97.4*	5.4	2.5	*46.3*
76.6	14.57	1,170	-------	-------	13.8	--------	--------	3.5	4.05	*86.4*	-------	-------	-------
78.7	14.57	1,190	-------	7.1	13.4	--------	*53*	3.9	4.05	*96.3*	5.3	2.6	*49.1*
84.1	14.73	1,370	-------	7.3	13.1	--------	*55.7*	3.8	3.8	*100*	5.65	2.6	*46.0*
81.3	14.77	1,370	10.4	6.8	13.2	*78.8*	*51.5*	3.5	3.8	*92.1*	5.1	2.6	*51*
(11)	(11)	(11)	(2)	(9)	(11)	*(2)*	*(9)*	(11)	(11)	*(11)*	(10)	(10)	*(10)*
--------	161.73	14,375	22.6	63.8	145.4	--------	--------	40	42.6	--------	52.35	25.3	--------
80.7	*14.70*	*1,307*	*11.3*	*7.09*	*13.22*	*85.3*	*54.1*	*3.64*	*3.87*	*93.9*	*5.23*	*2.53*	*48.3*
76.6	14.40	1,170	-------	6.5	12.5	--------	*50.4*	3.3	3.5	*86.4*	4.8	2.2	*45.8*
84.2	15.13	1,410	-------	7.6	13.8	--------	*57.1*	3.9	4.1	*100*	5.65	2.7	*55.1*

Miscellaneous Shoshonean Indian crania: Unidentified as to tribe

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
87.3	14.70	-------	-------	6.9	13.4	--------	*51.5*	3.5	3.7	*94.6*	4.9	2.3	*46.9*
82.5	15.07	-------	-------	7.1	13.2	--------	*53.8*	3.4	3.9	*87.2*	5	2.8	*56*
80.3	14.43	1,240	11.2	6.5	14	*80*	*46.4*	3.35	3.9	*85.9*	4.8	2.7	*56.2*
81.4	15.10	1,340	-------	6.9	14	--------	*49.3*	3.45	3.85	*89.6*	5.3	2.4	*45.3*
--------	-------	-------	-------	-------	-------	--------	--------	-------	-------	-------	-------	-------	-------
--------	-------	-------	-------	-------	14	--------	--------	-------	-------	-------	-------	-------	-------
81.5	14.73	1,275	-------	7.5	14	--------	*53.6*	3.5	3.95	*88.6*	5.35	2.3	*43*
--------	--------	-------	11.8	7.3	14.6	*80.8*	*50*	3.7	4	*92.5*	5	2.6	*52*
--------	--------	1,285	-------	7.6	14	--------	*54.3*	-------	-------	-------	5.5	2.9	*52.7*
(81.5)	14.73	1,280	11.3	6.8	13.9	*81.3*	*48.9*	3.3	3.8	*86.8*	5	2.6	*52*
(84.9)	15.10	-------	-------	7	13.2	--------	*53*	3.4	3.85	*88.3*	4.9	2.5	*51*
(85.5)	15.13	1,435	12.1	7.5	13.8	*87.7*	*54.3*	3.5	4.3	*81.4*	5.1	2.5	*49*
--------	-------	-------	-------	7.5	-------	--------	-------	3.25	3.9	*83.3*	5.1	2.6	*51*
--------	-------	-------	-------	7	13.6	--------	*51.2*	3.3	3.8	*86.8*	4.8	2.6	*54.2*
(5)	(8)	(6)	(4)	(12)	(12)	*(4)*	*(11)*	(11)	(11)	*(11)*	(12)	(12)	*(12)*
--------	118.99	7,855	46.4	85.6	165.7	--------	--------	37.65	42.95	--------	60.75	30.8	--------
82.6	*14.87*	*1,309*	*11.6*	*7.12*	*13.81*	*82.4*	*51.5*	*3.42*	*3.9*	*87.7*	*5.06*	*2.55*	*50.7*
80.3	14.43	1,240	11.2	6.5	13.2	*80*	*46.4*	3.25	3.7	*81.4*	4.8	2.3	*43*
87.3	15.13	1,435	12.1	7.6	14.6	*87.7*	*54.3*	3.7	4.3	*94.6*	5.5	2.9	*56.2*

Miscellaneous Shoshonean Indian crania: Unidentified as to tribe—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
315, 646	U. S. N. M.	Upper Kanab Creek, Utah.	Adult		18	13	11.9	*72.2*
243, 921	do	Henrys Lake, Idaho.	do		18.4	13.5	12.6	*73.4*
315, 644	do	Upper Kanab Creek, Utah.	do		17.4	13.1	13	*75.3*
243, 301	do	Nevada	do		16.4	13.1	12.6	*79.9*
243, 292	do	Provo, Utah	do	Slight occipital flattening.	(16)	(13.7)	(12.1)	*(85.6)*
292, 010	do	Iron County, Utah.	do	do	(16.7)	(14.3)	(13.1)	*(85.6)*
291, 863	do	do	do	Moderate occipital flattening.	(16.1)	(14.2)	(13.1)	*(88.2)*
243, 776	do	Camp Douglas, Utah.	do		17.3		11.6	
292, 011	do	Iron County, Utah.	do	Occipital flattening.				
					(5)	(4)	(5)	(4)
Totals					87.50	52.70	61.70	
Averages					*17.50*	*13.17*	*12.34*	*75.1*
Minima					16.4	13	11.6	*72.2*
Maxima					18.4	13.5	13	*79.9*

Shoshonean Indian crania: Utes, Gosh-Utes

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243, 772	U. S. N. M.	Filmore, Utah	Adult		18.4	13.4	12.6	*72.8*
243, 929	do	Willow Creek, Utah.	do		18.6	13.6	13	*73.1*
226, 084	do	Gunnison, Utah	do		19.2	14.1	13	*73.4*
243, 591	do	North of Colorado Springs.	do		19.5	14.4		*73.8*
243, 774	do	Willow Springs, Utah.	do		18.6	13.8	12.8	*74.2*
225, 085	do	Provo, Utah	do		18	13.4	13	*74.4*
225, 087	do	do	do		18.8	14	13	*74.5*
243, 930	do	Government Springs, Utah.	do		18.2	14.3	13.7	*78.6*
226, 085	do	White River, Utah.	do	Sutures somewhat abnormal.	(17.8)	(14.6)	(11.9)	*(82)*
					(8)	(8)	(7)	(8)
Totals					149.30	111	91.10	
Averages					*18.66*	*13.87*	*13.01*	*74.3*
Minima					18	13.4	12.6	*72.8*
Maxima					19.5	14.4	13.7	*78.6*

Miscellaneous Shoshonean Indian crania: Unidentified as to tribe—Continued

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
76.8	14.30	1,215	-------	6.6	12.7	-------	*52*	3.3	3.9	*84.6*	4.7	2.35	*50*
79	14.83	1,330	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
82.6	14.50	1,290	-------	6.9	12.9	-------	*53.5*	3.35	3.7	*90.5*	4.8	2.4	*50*
85.5	14.03	1,225	9.6	6	12.4	*77.4*	*48.4*	3	3.55	*84.5*	4.7	2.3	*48.9*
(81.5)	13.93	1,210	-------	6.7	12.5	-------	*53.6*	3.45	3.65	*94.5*	4.9	2.2	*44.9*
(84.5)	14.70	1,190	-------	-------	13.2	-------	-------	3.7	3.8	*97.4*	4.8	2.4	*50*
(86.5)	14.47	-------	-------	6.5	-------	-------	-------	3.4	3.9	*87.2*	4.5	2.5	*55.6*
-------	-------	-------	-------	6.9	-------	-------	-------	3.55	3.85	*92.2*	5	2.2	*44*
-------	-------	-------	10.6	6.3	13.3	*79.7*	*47.4*	3.1	3.5	*88.6*	4.4	2.4	*54.6*
(4)	(7)	(6)	(2)	(7)	(6)	*(2)*	*(5)*	(8)	(8)	*(8)*	(8)	(8)	*(8)*
-------	100.76	7,460	20.2	45.90	77	-------	-------	26.85	29.85	-------	37.80	18.75	-------
79.6	*14.39*	*1,243*	*10.1*	*6.56*	*12.83*	*78.6*	*50.9*	*3.36*	*3.73*	*89.9*	*4.72*	*2.34*	*49.6*
76.8	13.93	1,190	-------	6	12.4	-------	*47.4*	3	3.5	*84.5*	4.4	2.2	*44*
85.5	14.83	1,330	-------	6.9	13.3	-------	*53.6*	3.7	3.9	*97.4*	5	2.5	*55.6*

Shoshonean Indian crania: Utes, Gosh-Utes

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
79.2	14.80	1,380	-------	6.9	13.5	-------	*51.1*	3.5	3.9	*89.7*	5	2.4	*48*
80.8	15.07	1,450	-------	7.5	13.4	-------	*56*	3.45	3.9	*88.5*	5.3	2.4	*45.3*
78.1	15.43	1,365	-------	7.3	13.6	-------	*53.7*	3.4	3.8	*89.5*	5.4	2.8	*51.8*
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
79	15.07	1,465	-------	7.8	13.7	-------	*56.9*	3.65	4.1	*89*	5.3	2.4	*45.3*
82.8	14.80	1,420	-------	7	14	-------	*50*	3.7	4.1	*90.2*	5	2.25	*45*
79.3	15.27	1,490	-------	7	14.1	-------	*49.6*	3.2	4.15	*77.1*	5	2.4	*48*
84.3	15.40	1,460	-------	7.9	14.9	-------	*53*	3.5	4	*87.5*	5.7	2.6	*45.6*
(73.5)	14.77	1,390	10.9	6.9	13.5	*80.7*	*51.1*	3.3	4	*82.5*	5.3	2.7	*50.9*
(7)	(8)	(8)	-------	(8)	(8)	-------	*(8)*	(8)	(8)	*(8)*	(8)	(8)	*(8)*
-------	120.61	11,420	-------	58.30	110.70	-------	-------	27.70	31.95	-------	42	19.95	-------
80.5	*15.08*	*1,427*	-------	*7.29*	*13.84*	-------	*52.7*	*3.46*	*3.99*	*86.7*	*5.25*	*2.49*	*47.5*
78.1	14.77	1,365	-------	6.9	13.4	-------	*49.6*	3.2	3.8	*77.1*	5	2.25	*45*
84.3	15.43	1,490	-------	7.9	14.9	-------	*56.9*	3.7	4.15	*90.2*	5.7	2.8	*51.8*

Shoshonean Indian crania: Utes, Gosh-Utes—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,771	U. S. N. M.	Government Springs, Utah.	Adult		17.5	13	13.2	*74.3*
243,769	do	Dry Creek, Utah	do		17.1	12.9	12.2	*75.4*
243,768	do	do	do		17.1	13.4	12.3	*78.4*
					(3)	(3)	(3)	(3)
Totals					51.70	39.30	37.70	
Averages					*17.23*	*13.1*	*12.57*	*76*
Minima					17.1	12.9	12.2	*74.3*
Maxima					17.5	13.4	13.2	*78.4*

Shoshonean Indian crania: Paiutes, Pah-Vants

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
225,089	U. S. N. M.	Camp Lyon, Idaho	Adult		19.2	14	12	*72.9*
225,086	do	Utah	do		18	13.4	12.3	*74.4*
243,775	do	St. George, Utah	do		18.9	14.2	12.8	*75.1*
225,090	do	Fort Cameron, Utah.	do		18.4	14.3	13	*77.7*
225,088	do	Blue Mountains, Oreg.	do		18	14	12.6	*77.8*
225,256	do	Beaver, Utah	do	Atypical	(17.2)	(14.4)	(13.2)	*(83.7)*
					(5)	(5)	(5)	(5)
Totals					92.50	69.90	62.70	
Averages					*18.50*	*13.98*	*12.54*	*75.6*
Minima					18	13.4	12	*72.9*
Maxima					19.2	14.3	13	*77.8*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
326,349	U. S. N. M.	San Juan County, Utah.	Adult		18	13.2	[1] 12.6	*73.3*
243,614	do	Owens Valley, Calif.	do		17.4	13.6	12.5	*78.2*
225,109	do	Utah	do		17	13.7	12.1	*80.6*
					(3)	(3)	(3)	(3)
Totals					52.4	40.5	37.2	
Averages					*17.47*	*13.5*	*12.4*	*77.3*
Minima					17	13.2	12.1	*73.3*
Maxima					18	13.7	12.6	*80.6*

[1] Part damaged; measurement approximate.

Shoshonean Indian crania: Utes, Gosh-Utes—Continued

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
86.6	14.57	1,390	-------	6.5	12	-------	*54.2*	3.6	3.8	*94.7*	4.6	2.4	*52.2*
81.3	14.07	1,210	-------	6.9	12.9	-------	*53.5*	3.4	3.9	*87.2*	4.8	2.3	*47.9*
80.6	14.27	1,145	-------	7.1	12.8	-------	*55.5*	3.4	3.7	*91.9*	4.8	2.4	*50*
(3)	(3)	(3)	-------	(3)	(3)	-------	*(3)*	(3)	(3)	*(3)*	(3)	(3)	*(3)*
-------	42.91	3,745	-------	20.5	37.7	-------	-------	10.4	11.4	-------	14.2	7.1	-------
82.9	*14.30*	*1,248*	-------	*6.83*	*12.57*	-------	*54.4*	*3.47*	*3.8*	*91.2*	*4.73*	*2.37*	*50*
80.6	14.07	1,145	-------	6.5	12	-------	*53.5*	3.4	3.7	*87.2*	4.6	2.3	*47.9*
86.6	14.57	1,390	-------	7.1	12.9	-------	*55.5*	3.6	3.9	*94.7*	4.8	2.4	*52.2*

Shoshonean Indian crania: Paiutes, Pah-Vants

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
72.3	15.27	1,460	-------	7.6	13.8	-------	*55.1*	3.7	4	*92.5*	5.6	2.4	*42.9*
78.3	14.57	1,290	-------	7.8	13.45	-------	*58*	3.75	3.9	*96.2*	5.7	2.2	*38.6*
77.3	15.30	1,370	11.7	7.5	15.3	*76.5*	*49*	3.5	4	*87.5*	5.3	3	*56.6*
79.5	15.23	1,465	11.9	7.3	14.5	*82.1*	*50.3*	3.5	4.1	*85.4*	5.1	2.6	*51*
78.8	14.87	1,330	-------	7.6	14.4	-------	*52.7*	3.7	4.2	*88.1*	5.7	2.5	*43.9*
(83.5)	(14.93)	(1,500)	(11.6)	(7.2)	(13.7)	*(84.7)*	*(52.6)*	(3.5)	(3.95)	*(88.6)*	(5.4)	(2.9)	*(53.7)*
(5)	(5)	(5)	(2)	(5)	(5)	*(2)*	*(5)*	(5)	(5)	*(5)*	(5)	(5)	*(5)*
-------	75.24	6,915	23.6	37.8	71.45	-------	-------	18.15	20.20	-------	27.40	12.70	-------
77.2	*15.05*	*1,383*	*11.8*	*7.56*	*14.29*	*79.2*	*52.9*	*3.63*	*4.04*	*89.8*	*5.48*	*2.54*	*46.3*
72.3	14.57	1,290	-------	7.3	13.45	-------	*49*	3.5	3.9	*85.4*	5.1	2.2	*38.6*
79.5	15.30	1,465	-------	7.8	15.3	-------	*58*	3.75	4.2	*96.2*	5.7	3	*56.6*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
80.8	14.60	1,335	-------	-------	[1] 12.6	-------	-------	-------	-------	-------	-------	-------	-------
80.6	14.50	1,260	-------	6.6	-------		-------	3.2	3.6	*88.9*	4.7	2.7	*57.4*
78.8	14.27	1,225	-------	6.2	12.8	-------	*48.4*	3.4	3.8	*89.5*	4.5	2.5	*55.6*
(3)	(3)	(3)	-------	(2)	(2)	-------	-------	(2)	(2)	*(2)*	(2)	(2)	*(2)*
-------	43.37	3,820	-------	12.8	25.4	-------	-------	6.6	7.4	-------	9.2	5.2	-------
80.1	*14.46*	*1,273*	-------	*6.4*	*12.7*	-------	-------	*3.3*	*3.7*	*89.2*	*4.6*	*2.6*	*56.5*
78.8	14.27	1,225	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
80.8	14.60	1,335	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------

Shoshonean: Summary of measurements

MALE

	Bannock	Blackfeet (Siksika)	Piegan	Tribe unidentified	Utes, Gosh-Utes	Paiutes (Pah-Vants)
Number of skulls	(1)		(11)	(12)	(8)	(5)
Vault:						
Length	18.2		18.44	17.95	18.66	18.5
Breadth	13.4		13.98	13.66	13.87	13.98
Height	13		13.26	12.98	13.01	12.54
Cranial Index	*73.6*		*75.8*	*76.2*	*74.3*	*75.6*
Mean Height Index	*82.3*		*81.8*	*82.6*	*80.5*	*77.2*
Module	14.87		15.25	14.87	15.08	15.05
Capacity	1,320		1,454	1,309	1,427	1,383
Face:						
M.-N. Height	11.3			11.6		11.8
Alv. Pt.-N. Height	6.7		7.56	7.12	7.29	7.56
Breadth	14.1		14.09	13.81	13.84	14.29
Facial Index, total	*80.1*			*82.4*		*79.2*
Facial Index, upper	*47.5*		*53.7*	*51.5*	*52.7*	*52.9*
Orbits:						
Mean Height	3.45		3.58	3.42	3.46	3.63
Mean Breadth	4		3.90	3.9	3.99	4.04
Mean Index	*86.2*		*91.8*	*87.7*	*86.7*	*89.8*
Nose:						
Height	4.9		5.42	5.06	5.25	5.48
Breadth	2.6		2.6	2.55	2.49	2.54
Index	*53.1*		*48*	*50.7*	*47.5*	*46.3*

FEMALE

	Bannock	Blackfeet	Piegan	Tribe unidentified	Utes, Gosh-Utes	Paiutes (Pah-Vants)
Number of skulls		(2)	(11)	(8)	(3)	(3)
Vault:						
Length		17.8	17.60	17.5	17.23	17.47
Breadth		13.8	13.85	13.17	13.1	13.5
Height			12.69	12.34	12.57	12.4
Cranial Index		*77.5*	*78.7*	*75.1*	*76*	*77.3*
Mean Height Index			*80.7*	*79.6*	*82.9*	*80.1*
Module			14.70	14.39	14.3	14.46
Capacity		1,290	1,307	1,243	1,248	1,273
Face:						
M.-N. Height			[1] 11.3	10.1		
Alv. Pt.-N. Height		7.35	7.09	6.56	6.83	6.4
Breadth		13.25	13.22	12.83	12.57	12.7
Facial Index, total			[1] 85.3	*78.6*		
Facial Index, upper		*55.5*	*54.1*	*50.9*	*54.4*	
Orbits:						
Mean Height		3.55	3.64	3.36	3.47	3.3
Mean Breadth		3.95	3.87	3.73	3.8	3.7
Mean Index		*89.9*	*93.9*	*89.9*	*91.2*	*89.[illegible]*
Nose:						
Height		5.3	5.23	4.72	4.73	4.[illegible]
Breadth		2.8	2.53	2.34	2.37	2.[illegible]
Index		*52.8*	*48.3*	*49.6*	*50*	[illegible]

[1] Two skulls.

NOTES ON THE SHOSHONEAN TRIBES

1. The tribes of this group, as far as represented, show a fairly uniform type.

2. This type is characterized by—

    Mescocephaly;

    Low to medium height of the vault;

    Medium face, orbits, and nose.

3. The type is not far from the Algonkin, but differs from this by a perceptibly lower vault.

Errata.—The records of the Blackfoot (Siksika) and Piegan Indian crania on pages 92–100 should be transferred to the Algonkin group. *Proc. No.* 2631.

CALIFORNIANS

Northern California Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial index*
12/81	U. of C.	Humboldt Bay	35		18.1	13.2	12.6	*72.9*
225,168	U. S. N. M.	Hoopa Valley	40		18	13.75	13	*76.4*
12/80	U. of C.	Gunthers Island, Humboldt Bay.	60		18.25	14.15	13.25	*77.5*
225,204	U. S. N. M.	Dixie Valley	Adult	Slight asymmetry	17.9	14.75	13.5	*82.4*
					(4)	(4)	(4)	(4)
Totals					72.25	55.85	52.35	
Averages					*18.06*	*13.96*	*13.09*	*77.3*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial index*
12/78	U. of C.	Redding, Shasta County.	40		17.3	13.4	11.8	*77.5*
243,617	U. S. N. M.	Pitt River	Adult		17.6	14.4	11.7	*81.8*
					(2)	(2)	(2)	(2)
Totals					34.9	27.8	23.5	
Averages					*17.45*	*13.9*	*11.75*	*79.7*

[1] Part damaged; measurement approximate.

Konkan (Maidu) Indian crania, California

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,615	U. S. N. M.	Round Valley	Adult		19.0	13.1	12.9	*69.0*
243,621	do	do	do		18.4	12.8	12.5	*69.6*
243,616	do	do	do		18.4	13.0	13.2	*70.6*
243,622	do	do	do		18.2	13.2	12.6	*72.5*
					(4)	(4)	(4)	(4)
Totals					74.0	52.1	51.2	
Averages					*18.50*	*13.02*	*12.80*	*70.4*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
243,619	U. S. N. M.	Round Valley	Adult		17.6	12.6	11.6	*71.6*
243,623	do	do	do		17.7	13.7	12.0	*77.4*
243,618	do	do	do		17.1	13.4	12.2	*78.4*
243,620	do	do	do		17.2	13.6	12.6	*79.1*
					(4)	(4)	(4)	(4)
Totals					69.6	53.3	48.4	
Averages					*17.40*	*13.32*	*12.10*	*76.6*

CALIFORNIANS

Northern California Indian crania

MALE

Mean height index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion height (a)	Alveol. Pt.-Nasion height (b)	Diam. Bizygomatic maxim. (c)	*Facial index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital index, mean*	Nose, Height	Nose, breadth maxim.	*Nasal index*
80.5	14.63	------	------	7.3	12.8	------	*57*	3.6	3.9	*92.3*	4.9	2.2	*44.9*
81.9	14.92	1,290	------	6.8	14	------	*48.6*	3.45	3.75	*92*	5.3	2.3	*43.4*
81.8	15.22	1,315	12.6	7.75	13.5	*93.3*	*57.4*	3.3	3.85	*85.7*	5.4	2.4	*44.4*
82.7	15.38	1,440	11.3	7.1	14.1	*80.1*	*50.3*	3.55	4.05	*87.7*	5.1	2.5	*49*
(4)	(4)	(3)	(2)	(4)	(4)	(2)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
------	60.15	4,045	23.9	28.95	54.40	------	------	13.90	15.55	------	20.70	9.40	------
81.7	*15.04*	*1,348*	*11.95*	*7.24*	*13.6*	*86.6*	*53.2*	*3.47*	*3.89*	*89.4*	*5.17*	*2.35*	*45.4*

FEMALE

Mean height index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion height (a)	Alveol. Pt.-Nasion height (b)	Diam. Bizygomatic maxim. (c)	*Facial index, total*	*Facial index, upper*	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital index, mean*	Nose, Height	Nose, breadth maxim.	*Nasal index*
76.9	14.17	1,105	10.5	[1]6.5	------	------	------	3.25	3.95	*82.3*	4.65	------	------
73.1	14.57	1,370	------	7.2	------	------	------	------	------	------	5.3	2.4	*45.3*
(2)	(2)	(2)	------	(2)	------	------	------	------	------	------	(2)	------	------
------	28.74	2,475	------	13.7	------	------	------	------	------	------	9.95	------	------
75	*14.37*	*1,237*	------	*6.85*	------	------	------	------	------	------	*4.97*	------	------

Konkan (Maidu) Indian crania, California

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
80.4	15.00	1,275	------	7.5	------	------	------	3.5	3.9	*89.7*	5.5	2.2	*40.0*
80.1	14.57	1,240	------	6.7	13.4	------	*50.0*	3.5	3.7	*94.6*	5.0	2.6	*52.0*
84.1	14.87	------	------	6.7	------	------	------	3.25	3.9	*83.3*	4.7	2.25	*47.9*
80.2	14.67	1,255	------	6.6	------	------	------	3.15	3.7	*85.1*	4.9	2.4	*49*
(4)	(4)	(3)	------	(4)	------	------	------	(4)	(4)	(4)	(4)	(4)	(4)
------	59.11	3,770	------	27.5	------	------	------	13.40	15.20	------	20.1	9.45	------
81.2	*14.78*	*1,257*	------	*6.88*	------	------	------	*3.35*	*3.80*	*88.2*	*5.02*	*2.36*	*47.0*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total*	*Facial Index, upper*	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
76.8	13.93	1,100	------	6.2	12.8	------	*48.4*	3.25	3.6	*90.3*	4.55	2.6	*57.2*
76.4	14.47	1,260	------	5.8	12.8	------	*45.3*	3.40	3.8	*89.5*	4.3	2.7	*62.8*
80.0	14.23	1,220	------	6.3	12.2	------	*51.6*	3.30	3.5	*94.3*	4.75	2.35	*49.5*
81.8	14.47	1,335	------	6.4	12.6	------	*50.8*	3.25	3.6	90.3	4.6	2.3	*50.0*
(4)	(4)	(4)	------	(4)	(4)	------	(4)	(4)	(4)	(4)	(4)	(4)	(4)
------	57.10	4,915	------	24.7	5.04	------	------	13.20	14.5	------	18.20	9.95	------
78.8	*14.28*	*1,229*	------	*6.18*	*12.6*	------	*49.0*	*3.30*	*3.62*	*91.0*	*4.55*	*2.49*	*54.7*

Miscellaneous California Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
242, 302	U. S. N. M.	Probably Santa Barbara County.	Adult		18.6	14.9	13.2	*80.1*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
242, 305	U. S. N. M.	Probably Santa Barbara County.	Adult		18	12.8	12.4	*71.1*
242, 306	do	do	do		17.2	13.6	12.9	*79.1*
242, 299	do	Unknown	do		17.4	14.2	12.6	*81.6*
242, 303	do	Probably Santa Barbara County.	do		17.1	14.1	12.6	*82.5*
225, 174	do	Unknown	do		17.2	14.2	13.2	*82.6*
					(5)	(5)	(5)	(5)
Totals					86.90	68.90	63.70	
Averages					*17.38*	*13.78*	*12.74*	*79.3*

[1] Part damaged; measurement approximate.

San Francisco Bay and vicinity Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum).	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
12/74	U. of C.	Millbrae	55		18.5	13.2	[1] 13	*71.4*
326, 153	U. S. N. M.	Lodi	Adult		18.9	13.8	14	*73*
225, 176	do	Centerville	55		18.7	13.7	14.2	*73.3*
12/73	U. of C.	Millbrae	50		18.1	13.45	13.7	*74.3*
225, 179	U. S. N. M.	Centerville	40		18.5	13.8	13.3	*74.6*
12/67	U. of C.	Sausalito	60		19	14.25	13.7	*75*
225, 180	U. S. N. M.	Centerville	50		18.4	13.8	14.4	*75*
225, 192	do	Yerba, Buena Island.	65		18.6	14	14.25	*75.3*
12/72	U. of C.	Millbrae	60		18.3	13.85		*75.7*
225, 172	U. S. N. M.	Cave in Calaveras County.	60		18.7	14.2	13.6	*75.9*
225, 177	do	Centerville	65		18	13.7	13.8	*76.1*
225, 181	do	do	55		18.2	13.9	13.1	*76.4*
225, 199	do	San Felipe	60		17.5	13.4	12.9	*76.6*
12/79	U. of C.	Felton	55		17.35	13.3	13.1	*76.7*
225, 194	U. S. N. M.	Angel Island	30		18	13.8	13.5	*76.7*
225, 169	do	Sutter County	50		18.6	14.3	14.6	*76.9*
225, 178	do	Centerville	23		18.7	14.4	13.9	*77*
12/68	U. of C.	Sausalito	60		18.8	14.5	[1] 14	*77.1*
225, 183	U. S. N. M.	Centerville	65		18.3	14.2	[1] 13.6	*77.6*
225, 198	do	San Jose Mission	50		17.9	13.9	13.5	*77.6*
12/85	U. of C.	Inverness	50		17.25	13.4	13.2	*77.7*
225, 170	U. S. N. M.	Sutter County	55		18.4	14.3	14	*77.7*
225, 193	do	Angel Island	50		18.5	14.4	13.7	*77.8*
178, 148	do	Palo Alto	35		17.6	13.7	13.8	*77.8*

[1] Part damaged; measurement near or very near.

Miscellaneous California Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
78.8	15.57	1,550	--------	[1] 7.1	14.3	--------	*49.6*	3.9	4.1	*92.7*	5.2	2.5	*48.1*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
80.5	14.40	1,315	10.4	6.6	12.8	*81.2*	*51.6*	3.25	3.75	*86.7*	4.8	2.3	*47.9*
83.8	14.57	1,265	--------	--------	12.9	--------	--------	3.6	3.75	*96*	4.6	2.4	*52.2*
79.8	14.73	1,300	--------	6.9	13.2	--------	*52.3*	3.4	3.65	*93.2*	4.9	2.6	53.1
80.8	14.60	1,310	10.8	6.6	--------	--------	--------	3.45	3.75	*92*	5.1	2.4	47.1
84.1	14.87	--------	--------	7.2	13.8	--------	*52.2*	3.6	4	*90*	5.4	2.5	*46.3*
(5)	(5)	(4)	(2)	(4)	(4)	--------	(3)	(5)	(5)	(5)	(5)	(5)	(5)
--------	73.17	5,190	21.2	27.30	52.70	--------	--------	17.30	18.90	--------	24.80	12.20	--------
81.8	*14.63*	*1,297*	*10.6*	*6.82*	*13.17*	--------	*52*	*3.46*	*3.78*	*91.5*	*4.96*	*2.44*	*49.2*

San Francisco Bay and vicinity Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
82	14.90	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
85.6	15.57	1,450	[1] 11.3	--------	[1] 13.1	*86.3*	--------	3.45	3.85	*89.6*	5.1	2.4	*47.1*
87.6	15.53	1,350	--------	7.6	13.1	--------	*58*	3.45	3.7	*93.2*	5.5	2.5	*45.4*
86.9	15.08	1,200	--------	--------	--------	--------	--------	3.5	3.8	*92.1*	4.95	2.5	*50.5*
82.4	15.20	1,445	12.9	7.9	13.9	*92.8*	*56.8*	3.8	3.8	*100*	5.4	2.1	*38.9*
82.4	15.65	1,400	11.4	6.85	13.4	*85.1*	*51.1*	3.7	4.15	*89.2*	4.75	2.3	*48.4*
89.4	15.53	1,510	12.7	7.8	--------	--------	--------	3.5	3.75	*93.3*	5.4	2.3	*42.6*
87.4	15.62	1,410	[1] 11.8	[1] 7.1	13.9	*84.9*	*51.1*	3.3	4.05	*81.5*	5.05	2.7	*53.5*
--------	--------	1,305	--------	--------	--------	--------	--------	3.4	3.65	*93.2*	4.75	2.25	*47.[illegible]*
82.7	15.50	--------	--------	7.6	--------	--------	--------	3.7	3.9	*94.9*	5.25	2.65	*50.5*
87.1	15.17	--------	--------	[1] 7.6	13.35	--------	*56.9*	--------	--------	--------	5.5	2.6	*47.3*
81.6	15.07	1,308	12.9	8.15	14.5	*89*	*56.2*	3.55	3.75	*94.7*	5.7	2.45	43
83.5	14.60	1,180	[1] 11.7	7.2	[1] 13.7	*85.4*	*52.6*	3.55	3.6	*98.6*	4.8	2.5	*52.1*
85.5	14.58	1,195	[1] 11.4	7.15	[1] 12.9	*88.3*	*55.4*	3.25	4	*81.3*	5.1	2.25	*44.1*
84.9	15.10	--------	11.4	6.8	13.2	*86.4*	*51.5*	3.2	3.6	*88.9*	4.8	2.45	*51*
88.8	15.83	1,480	--------	7.5	--------	--------	--------	3.5	3.75	*93.3*	5.65	2.65	*46.9*
84	15.67	1,460	12	7.4	14.3	*83.9*	*51.8*	3.55	3.6	*98.6*	5.15	2.3	*44.7*
84.1	15.77	1,515	11.6	[1] 6.9	14.5	*80*	*47.6*	3.25	3.85	*84.4*	4.55	2.7	*59.4*
83.7	15.37	1,360	--------	--------	13.6	--------	--------	3.3	3.7	*89.2*	--------	--------	--------
84.9	15.10	1,345	--------	6.8	--------	--------	--------	3.2	3.65	*87.7*	5	2.55	*51*
86.1	14.62	1,305	10.85	6.65	13.2	*82.2*	*50.4*	3.35	4	*83.8*	4.5	2.3	*51.1*
85.6	15.57	1,395	--------	[1] 7.3	--------	--------	--------	3.6	4	*90*	5.2	[1] 2.5	*48.1*
83.3	15.53	1,430	12.2	7.45	14.1	*86.5*	*52.8*	3.6	4.05	*88.9*	5.2	2.5	*48.1*
88.2	15.03	--------	--------	--------	[1] 13.4	--------	--------	--------	--------	--------	--------	--------	--------

San Francisco Bay and vicinity Indian crania—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim	Basion-Bregma height	*Cranial Index*
12/75	U. of C	San Francisco Bay	Adult		17.9	[1] 14	[1] 13.4	*78.2*
225, 191	U. S. N. M	Petaluma	60		18	14.1	13	*78.3*
12/84	U. of C	West Berkeley	55		18.5	14.6	13.8	*78.9*
12/71	do	Vallejo	55		17.9	14.2		*79.3*
225, 173	U. S. N. M	Cave in Calaveras County.	65	Possible slight occipital compression.	17.8	14.25		*80.1*
225, 212	do	Mare Island	Adult	Very slight occipital compression.	18.1	14.8	13.7	*81.8*
12/86	U. of C	Santa Cruz	50		18.05	15		*83.1*
225, 197	U. S. N. M	Monterey	50					
					(31)	(31)	(27)	*(31)*
Totals					565.05	434.20	368.75	
Averages					*18.23*	*14.01*	*13.66*	76.8
Minima					17.25	13.2	12.9	*71.4*
Maxima					19	15	14.6	*83.1*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim	Basion-Bregma height	*Cranial Index*
225, 186	U. S. N. M	Centerville	40		17.7	13.05	13.4	*73.7*
225, 196	do	Angel Island	55		16.9	12.9	12.8	*76.3*
12/83	U. of C	West Berkeley	55		17.35	13.25	12.6	*76.4*
225, 187	U. S. N. M	Centerville	55		16.7	12.8	13.2	*76.65*
225, 195	do	Angel Island	50		17.4	13.4	13.2	*77*
12/77	U. of C	West Berkeley	50		17.8	13.85		*77.8*
225, 188	U. S. N. M	Centerville	40		17.4	13.6	13.2	*78.2*
12/76	U. of C	West Berkeley	50		17.1	13.4	12.5	*78.4*
225, 185	U. S. N. M	Centerville	35		17.1	13.6	12.5	*79.5*
12/70	U. of C	Vallejo	Adult	Very slight occipital flattening.	16.8	13.4	12.5	*79.8*
12/82	do	Sather (near Oakland).	35		17.3	13.8	12.6	*79.8*
225, 184	U. S. N. M	Centerville	40	Slight occipital flattening.	(16.3)	(13.2)	(13.9)	*(80.1)*
12/69	U. of C	Vallejo	Adult	do	(16.5)	(13.8)	(12.4)	*(83.6)*
					(11)	(11)	(10)	*(11)*
Totals					189.55	147.05	128.50	
Averages					*17.23*	*13.37*	*12.85*	77.6
Minima					16.7	12.8	12.5	*73.7*
Maxima					17.8	13.85	13.4	*79.8*

[1] Part damaged; measurement near or very near.

San Francisco Bay and vicinity Indian crania—Continued

MALE—Continued

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
84	15.10	------	------										
81.5	15.03	1,340	------	[1] 7.5	13.7	------	*54.7*	3.6	3.9	*92.3*	5.2	2.75	*52.9*
83.4	15.63	------	------	------	------	------	------	3.15	4	*78.8*	------	------	------
------	------	1,240	11.8	7.3	14.2	*83.1*	*51.4*	3.55	3.85	*92.2*	4.95	2.45	*49.5*
83.3	15.53	1,570	------	6.85	------	------	------	3.5	4	*87.5*	5.05	2.55	*55*
------	------	------	------	------	------	------	------	3.55	3.95	*89.9*	5.35	2.5	*46.7*
------	------	------	------	7.3	------	------	------	3.4	3.75	*88.9*	4.8	2.25	*46.9*
(27)	(27)	(22)	(14)	(22)	(18)	*(13)*	*(15)*	(27)	(27)	*(27)*	(26)	(26)	*(26)*
------	412.88	30,193	165.95	160.70	246.05	------	------	93.45	103.65	------	132.65	63.95	------
84.8	*15.29*	*1,372*	*11.85*	*7.3*	*13.67*	*85.7*	*53.2*	*3.46*	*3.84*	*90.2*	*5.1*	*2.46*	*48.2*
81.5	14.58	1,180	10.85	6.65	12.9	*80*	*47.6*	3.15	3.6	*78.8*	4.5	2.1	*38.9*
89.4	15.83	1,570	12.9	8.15	14.5	*92.8*	*58*	3.8	4.15	*100*	5.7	2.75	*59.4*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
87.1	14.72	1,275	------	7.1	------	------	------	3.2	3.5	*91.4*	4.7	[illegible]	*44.6*
85.9	14.20	1,100	------	6.3	12.7	------	*49.6*	3.3	3.75	*88*	4.5	------	------
79.8	14.40	1,180	------	------	13.7	------	------	3.75	4.1	*91.5*	5.1	2.35	*46.1*
89.5	14.23	1,065	------	6.4	12.65	------	*50.6*	2.9	3.6	*80.6*	4.65	2.4	*51.6*
85.7	14.67	1,190	10.9	6.9	13.2	*82.6*	*52.3*	3.4	3.9	*87.2*	4.8	2.35	*49*
------	------	------	------	------	------	------	------	3.25	3.9	*83.3*	5.05	2.35	*46.5*
85.2	14.73	1,190	11.4	7.2	13	*87.7*	*55.4*	3.55	3.85	*92.2*	4.85	2.65	*54.6*
82	14.33	------	10.9	6.75	12.5	*87.2*	*54*	3.3	3.85	*85.7*	4.95	2.55	*51.5*
81.4	14.40	------	------	6.4	13	------	*48.1*	2.9	3.5	*82.9*	4.45	2.3	*51.7*
82.8	14.23	1,095	------	------	------	------	------	3.45	3.9	*88.5*	4.5	2.4	*53.3*
81	14.57	1,250	11.3	7.15	12.7	*89*	*56.3*	3.55	4	*88.8*	4.95	2.3	*46.5*
(94.2)	14.47	1,250	11.2	6.85	12.7	*88.2*	*53.9*	3.45	3.8	*90.8*	4.75	2.5	*52.6*
(81.8)	14.23	1,075	------	6.15	[1] 12.7	------	*48.4*	3.2	3.65	*87.7*	4.8	2.25	*46.9*
(10)	(12)	(10)	(5)	(10)	(10)	*(5)*	*(9)*	(13)	(13)	*(13)*	(13)	(12)	*(12)*
------	173.18	11,670	55.70	67.20	128.85	------	------	43.20	49.30	------	62.05	28.40	------
84.3	*14.43*	*1,167*	*11.14*	*6.72*	*12.88*	*86.9*	*52.2*	*3.32*	*3.79*	*87.6*	*4.77*	*2.37*	*49.3*
79.8	14.2	1,065	10.9	6.15	12.5	*82.6*	*48.1*	2.9	3.5	*80.6*	4.45	2	*42.6*
89.5	14.73	1,275	11.4	7.2	13.7	*89*	*56.3*	3.75	4.1	*92.2*	5.1	2.65	*54.6*

California Indian crania, Santa Barbara County (mainland)

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
242,142	U. S. N. M.	Los Pueblos	Adult		18.2	13.2	------	*72.5*
242,113	do	do	do		18.7	13.6	12.6	*72.7*
241,908	do	Santa Barbara County.	do		18.6	13.6	13.1	*73.1*
227,521	do	La Patera	do		18.6	13.8	13.8	*74.2*
241,909	do	Santa Barbara County.	do		18.2	13.5	12.5	*74.2*
241,905	do	do	do		17.9	13.3	13.6	*74.3*
291,910	do	do	do		17.6	13.1	13.0	*74.4*
242,114	do	Los Pueblos	do		19.0	14.2	12.9	*74.7*
241,904	do	La Patera	do		18.2	13.6	13.4	*74.7*
242,147	do	Santa Barbara County.	do		18.4	13.8	12.6	*75*
242,159	do	do	do		18.4	13.8	13.8	*75*
241,907	do	La Patera	do		18.4	13.8	13.7	*75*
242,096	do	Los Pueblos	do		18.3	13.8	13.5	*75.4*
242,175	do	Santa Barbara County.	do		18.5	14.0	13.2	*75.7*
242,153	do	do	do		18.1	13.7	13.8	*75.7*
242,182	do	do	do		18.4	14.0	13.0	*76.1*
242,129	do	Los Pueblos	do		18.6	14.2	13.3	*76.3*
242,183	do	Santa Barbara County.	do		17.8	13.6	13.2	*76.4*
242,145	do	do	do		17.7	13.6	12.9	*76.8*
242,135	do	Los Pueblos	do		18.2	14.0	12.5	*76.9*
242,144	do	Santa Barbara County.	Near senile.		18.2	14.0	12.6	*76.9*
242,143	do	do	Adult	Very slight asymmetry.	18.2	14.0	13.3	*76.9*
242,168	do	do	do		17.8	13.7	13.0	*77*
241,912	do	do	do		17.1	13.2	12.4	*77.2*
241,903	do	La Patera	do		17.6	13.6	13	*77.3*
242,167	do	Santa Barbara County.	do		17.6	13.6	13.3	*77.3*
242,148	do	do	do		17.6	13.6	12.8	*77.3*
241,914	do	La Patera	do		17.7	13.7	13.9	*77.4*
225,200	do	do	do		17.8	13.9	13	*78.1*
242,189	do	Santa Barbara County.	do		17.7	13.9	------	*78.5*
227,520	do	do	Near senile.		18	14.2	12.8	*78.9*
241,913	do	do	Adult		18	14.2	13.5	*78.9*
242,124	do	Los Pueblos	do		17.2	13.6	------	*79.1*
242,140	do	do	do		17.4	13.8	12.4	*79.3*
242,154	do	Santa Barbara County.	do		17.4	13.8	13.3	*79.3*
242,146	do	do	do		17.7	14.1	13.6	*79.7*
242,160	do	do	do		18.3	14.6	12.8	*79.8*
242,191	do	do	do	Very slight asymmetry.	18	14.4	14	*80*
242,184	do	do	do		17.8	14.3	13.7	*80.3*
242,176	do	do	do		17.6	14.2	13.2	*80.7*
242,170	do	do	do		17.8	14.4	14	*80.9*
241,906	do	do	do		16.9	13.7	13	*81.1*
242,149	do	do	do		17.1	14	13.4	*81.9*
242,173	do	do	do		17.8	14.6	14	*82*
241,911	do	do	do		------	------	13	------
242,101	do	Los Pueblos	do		------	13.3	12.6	------
242,111	do	do	do		18.5	------	------	------
242,112	do	do	do		18	------	------	------
242,136	do	do	do	Moderate occipital compression.	17.1	------	13.1	------
242,139	do	do	do		17.6	------	12.6	------
242,141	do	do	do		------	------	------	------
242,152	do	Santa Barbara County.	do		------	------	------	------
					(48)	(45)	(45)	*(44)*
Totals					861.30	622.60	592.70	------
Averages					*17.94*	*13.83*	*13.17*	*77.1*
Minima					16.9	13.1	12.4	*72.5*
Maxima					19	14.6	14	*82*

California Indian crania, Santa Barbara County (mainland)

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
				7.2				3.4	3.8	89.5	5.1	2.6	51
78.0	14.97	1,360		7.0	13.3		52.6	3.45	3.8	90.8	5.05	2.5	49.5
81.4	15.13		10.9	6.7				3.45	3.85	89.6	4.9	2.6	53.1
85.2	15.40	1,435	12.4	7.2	13.8	89.9	52.2	3.3	4.05	81.5	5.0	2.55	51
78.9	14.73			6.55				3.25	3.5	92.9	4.5	2.3	51.1
87.2	14.93		12.2	7.35				3.25	3.6	90.3	5.4	2.2	40.7
84.7	14.57			6.9							4.8	2.25	46.9
77.7	15.37	1,440		7.4				3.9	4.15	94	5.3	2.4	45.3
84.3	15.07			6.85				3.45	3.95	87.3	4.55	2.0	44
78.3	14.93			6.7	13.8		49.6	3.6	3.8	94.7	5.1	2.45	48.0
83.1	15.33	1,490	11.6	7.3	13.9	83.4	52.5	3.35	3.9	85.9	5.0	2.1	42
82.5	15.30	1,455		6.9	14.0		49.3	3.45	4.0	86.2	5.2	2.7	51.9
81.6	15.20		11.2	6.7				3.3	3.65	90.4	4.7	2.25	47.9
81.2	15.23	1,440		6.9	13.7		50.4	3.4	3.8	89.5	4.8	2.5	52.1
86.8	15.20	1,410	10.3	6.0	14.1	73.0	42.5	3.2	3.95	81.0	4.4	2.2	50
80.2	15.13			6.7	12.8		52.3	3.35	3.65	91.8	4.75	2.1	44.2
81.1	15.37		11.6	7.4				3.6	3.8	94.7	5.4	2.5	46.3
84.1	14.87	1,348		7.2				3.75	3.9	96.2	5.3	2.3	43.4
82.4	14.73	1,370	11.3	7.1				3.7	4.0	92.5	5.3	2.7	50.9
77.6	14.90		10.8	6.9	13.5	80	51.1	3.3	3.9	84.6	4.8	2.25	46.9
78.3	14.93	1,390	10.8		12.9	83.7		3.4	3.88	87.6	4.8	2.6	54.2
82.6	15.17	1,480	12.4	7.7	13.8	89.9	55.8	3.45	3.8	90.8	5.0	2.25	45
82.5	14.83	1,410		7.2	13.9		51.8	3.5	3.9	89.7	5.0	2.5	50
81.8	14.23		11.6	7.2	13.2	87.9	54.6	3.7	3.8	97.4	4.95	2.5	50.5
83.3	14.73	1,230	11.9	7				3.25	3.75	86.7	4.6	2.4	52.2
85.3	14.83	1,365		6.7				3.38	3.9	86.7	4.8	2.3	47.9
82	14.67	1,275	10.5	6.7	13.7	76.6	48.9	3.25	3.6	90.3	4.5	2.3	51.1
88.5	15.10	1,335		6.8				3.65	3.8	96	4.9	2.5	51
82	14.90	1,240		6	13.1		45.8	3.1	3.75	82.7	4.3	2.25	52.3
				6.5	13.5		48.2				4.6	2.5	54.4
79.5	15.00	1,295	11.2	6.9	13.4	83.6	51.5	3.35	3.85	87	4.75	2.7	56.8
83.8	15.23											2.35	
			11.2	7							4.7	2.15	45.7
79.5	14.53	1,305		7.3	13.3		54.9	3.95	3.9	101.3	5.3	2.4	45.3
85.3	14.87	1,370	11.3	7.1	13.5	83.7	52.6	3.4	3.7	91.9	4.85	2	41.3
85.5	15.13				13.6			3.3	3.75	88	4.7	2.3	48.9
77.8	15.23	1,420	11	6.9				3.4	3.95	86.1	5.1	2.8	54.9
86.4	15.47	1,460		7.1	13.3		53.4	3.5	3.85	90.9	5.2	2.2	42.3
85.4	15.27	1,500		7	13.8		50.7	3.35	3.7	90.5	4.85		
83	15.00	1,475		6.5				3.25	3.75	86.7	4.7	2.3	48.9
87	15.40	1,540		6.9	13.2		52.3	3.65	3.95	92.4	5	2.2	44
85	14.53		11.9	7.05				3.4	3.75	90.7	5.05	2.35	46.5
86.2	14.83	1,250	11.3	7.4	13.2	85.6	56.1	3.65	3.7	98.6	5.2	2.7	51.9
86.4	15.47	1,435		6.8	13.3		51.1	3.35	4	83.8	4.7	2.4	51.1
					13.9							2.5	
												2.65	
				7.6	14.4		52.7	3.22	3.85	83.6	5.3	2.45	46.2
				6.9				3.35	4	83.8	4.8	2.3	47.9
			11.8	7.1							5.1	2.1	41.2
				6.9				3.9			5	2.5	50
				7.3				3.65	4.1	88.5	5	2.4	48
			10.9	6.8	13.2	82.6	51.5	3.3	3.7	89.2	4.7	2.3	48.9
(41)	(41)	(27)	(22)	(47)	(28)	(12)	(25)	(45)	(44)	(44)	(49)	(51)	(48)
	615.71	37,523	250.10	327.30	379.10			155.10	168.73		240.80	121.60	
82.9	15.02	1,390	11.37	6.96	13.54	83.3	51.3	3.45	3.83	89.6	4.91	2.38	48.4
77.6	14.23	1,230	10.3	6	12.8	73	42.5	3.1	3.5	81	4.3	2	40.7
88.5	15.47	1,540	12.4	7.7	14.4	89.9	56.1	3.95	4.15	101.3	5.4	2.8	56.8

California Indian crania, Santa Barbara County (mainland)—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
242,109	U. S. N. M.	Los Pueblos	Adult		17.1	12.7	13.6	*74.3*
242,185	do	Santa Barbara County.	do		17.8	13.3	12.6	*74.7*
242,100	do	Los Pueblos	do		17.9	13.5	12.6	*75.4*
242,325	do	La Patera	do		17.9	13.5	12.4	*75.4*
242,169	do	Santa Barbara County.	Near senile.		18.0	13.6	12.2	*75.6*
242,177	do	do	Adult		17.4	13.2	12.3	*75.9*
242,122	do	Los Pueblos	do		17.6	13.4	12.0	*76.1*
242,334	do	La Patera	do		17.8	13.6	12.4	*76.4*
242,181	do	Santa Barbara County.	do		17.8	13.6	13.1	*76.4*
242,323	do	La Patera	do		17.2	13.2	12.4	*76.7*
242,320	do	do	do		18.0	13.8	12.9	*76.7*
242,171	do	Santa Barbara County.	do		17.2	13.2	12.6	*76.7*
242,321	do	La Patera	do		16.9	13.0		*76.9*
242,150	do	Santa Barbara County.	do		16.2	12.5	11.6	*77.2*
242,326	do	La Patera	do		16.8	13.0	12.8	*77.4*
242,165	do	Santa Barbara County.	do		17.4	13.5	13.0	*77.6*
242,104	do	Los Pueblos	do		17.1	13.3	12.7	*77.8*
242,336	do	La Patera	do		16.4	12.8	11.3	*78.0*
242,180	do	Santa Barbara County.	do		17.8	14.0	12.8	*78.6*
242,155	do	do	do		16.2	12.8	12.2	*79.0*
242,157	do	do	do		17.2	13.6	12.0	*79.1*
242,179	do	do	do		17.2	13.6	11.9	*79.1*
242,092	do	Los Pueblos	do		17.0	13.5	12.2	*79.4*
242,133	do	do	Near senile.		16.6	13.2	12.8	*79.5*
242,172	do	Santa Barbara County.	Adult		16.6	13.2	13.0	*79.5*
242,110	do	Los Pueblos	do		17.2	13.7	13.0	*79.6*
242,105	do	do	do		17.2	13.8	12.7	*80.2*
242,330	do	La Patera	do		16.8	13.5	12.3	*80.4*
242,166	do	Santa Barbara County.	do		16.4	13.2	12.0	*80.5*
242,106	do	Los Pueblos	do		16.6	13.4	11.9	*80.7*
242,115	do	do	do		16.7	13.6	12.0	*81.4*
242,192	do	Santa Barbara County.	do		16.9	13.8		*81.7*
224,899	do	do	do		16.4	13.6	13.4	*82.9*
242,098	do	Los Pueblos	do		16.4	13.6	12.0	*82.9*
242,121	do	do	Near adult		16.8	14.0	12.2	*83.3*
242,117	do	do	Adult	Very slight asymmetry.	16.7	14.1	11.9	*84.4*
242,093	do	do	do		17.2		13.0	
242,091	do	do	do			13.2	12.6	
242,094	do	do	do			13.4	12.0	
242,134	do	do	do				12.2	
242,130	do	do	do					
					(37)	(38)	(38)	*(36)*
Totals					632.40	509.50	472.60	
Averages					*17.09*	*13.41*	*12.44*	*78.5*
Minima					16.2	12.5	11.3	*74.3*
Maxima					18	14.1	13.6	*84.4*

California Indian crania, Santa Barbara County (mainland)—Continued

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
91.3	14.47	1,170	-------	6.3	12.4	-------	50.8	3.00	3.60	83.3	4.2	2.2	52.4
81.0	14.57	1,250	-------	6.1	11.9	-------	51.3	3.20	3.75	85.4	4.2	2.2	52.4
80.2	14.67	1,230	11.3	6.7	12.4	91.1	54.0	3.20	3.80	84.2	4.5	2.5	55.6
79.0	14.60	1,310	-------	6.6	-------	-------	-------	3.70	3.90	94.9	4.9	2.4	49.0
77.2	14.60	1,285	-------	-------	-------	-------	-------	3.10	3.75	82.7	4.5	2.5	55.6
80.4	14.30	1,160	10.9	7.1	-------	-------	-------	3.45	4.00	86.2	4.8	2.2	45.8
77.4	14.33	-------	10.0	6.6	12.9	77.5	51.2	-------	-------	-------	-------	2.5	-------
79.0	14.60	1,255	-------	6.4	-------	-------	-------	3.25	3.60	90.3	4.5	2.4	53.3
83.4	14.83	1,325	-------	6.5	12.7	-------	51.2	3.30	3.75	88.0	4.8	2.1	43.8
81.6	14.27	1,160	-------	5.9	-------	-------	-------	3.25	3.65	89.0	4.4	2.15	48.9
81.1	14.90	-------	-------	6.2	12.8	-------	48.4	3.10	3.70	83.8	4.2	2.3	54.8
82.9	14.33	1,200	-------	6.5	13.0	-------	50.0	3.18	3.55	89.6	4.3	2.25	52.3
-------	-------	-------	-------	-------	-------	-------	-------	3.35	-------	-------	4.5	2.4	53.3
80.8	13.43	1,060	10.6	6.5	-------	-------	-------	3.20	3.55	90.2	4.6	2.4	52.2
85.9	14.20	1,180	-------	6.2	12.7	-------	48.8	3.35	3.65	91.8	4.6	2.5	54.4
84.1	14.63	1,285	-------	6.4	12.9	-------	49.6	3.15	3.55	88.7	4.3	2.3	53.5
83.6	14.37	1,230	10.1	6.7	13.0	77.7	51.5	3.40	3.75	90.7	4.7	2.55	54.3
77.4	13.50	1,070	-------	6.6	-------	-------	-------	3.30	3.65	90.4	4.5	2.5	55.6
80.5	14.87	1,300	-------	6.0	12.8	-------	46.9	3.65	3.90	93.6	4.5	2.4	53.3
84.1	13.73	1,080	9.6	6.0	11.9	80.7	50.4	3.20	3.60	88.9	4.6	2.4	52.2
77.9	14.27	1,185	10.8	6.6	12.6	85.7	52.4	3.00	3.60	83.3	4.6	2.5	54.4
77.3	14.23	1,200	-------	6.4	-------	-------	-------	3.17	3.90	81.3	4.3	2.3	53.5
80.0	14.23	1,160	-------	6.2	-------	-------	-------	3.60	3.70	97.3	4.7	2.5	53.2
85.9	14.20	1,150	-------	-------	13.5	-------	-------	3.65	4.15	88.0	5.0	2.5	50.0
87.2	14.27	1,225	-------	6.9	12.4	-------	55.6	3.20	3.50	91.4	4.7	2.2	46.8
84.1	14.63	1,295	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
81.9	14.57	-------	10.9	6.9	13.6	80.2	50.7	3.20	4.00	80.0	4.8	2.4	50.0
81.2	14.20	1,290	10.3	6.7	13.0	79.2	51.5	3.55	3.70	95.9	4.8	2.3	47.9
81.1	13.87	1,115	-------	6.7	12.8	-------	52.3	3.20	3.65	87.7	4.4	2.05	46.6
79.3	13.97	1,090	-------	6.4	-------	-------	-------	3.08	3.60	85.6	4.4	2.4	54.6
79.2	14.10	1,200	10.3	6.6	11.8	87.3	55.9	3.50	3.70	94.6	4.8	2.1	43.8
-------	-------	1,215	-------	6.6	-------	-------	-------	3.35	3.60	93.1	4.5	2.4	53.3
89.3	14.47	1,190	9.5	6.0	12.4	76.6	48.4	3.30	3.40	97.1	4.3	2.2	51.2
80.0	14.00	1,225	10.3	6.0	12.0	85.8	50.0	3.40	3.60	94.4	4.3	2.1	48.8
79.2	14.33	1,285	-------	6.7	-------	-------	-------	3.50	3.70	94.6	4.9	2.2	44.9
77.3	14.23	1,150	-------	6.7	12.2	-------	54.9	3.40	3.40	100.0	4.8	2.3	47.9
-------	-------	-------	10.3	6.5	12.6	81.8	51.6	-------	-------	-------	4.45	2.5	56.2
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	2.2	-------
-------	-------	-------	-------	-------	12.6	-------	-------	-------	-------	-------	-------	-------	-------
-------	-------	-------	11.1	6.7	12.6	88.1	53.2	-------	-------	-------	4.9	2.45	50.0
-------	-------	-------	-------	6.7	-------	-------	-------	-------	-------	-------	4.6	2.15	46.7
(34)	(34)	(32)	(14)	(35)	(25)	(12)	(23)	(34)	(33)	(33)	(37)	(39)	(37)
-------	486.77	38,525	146	226.6	315.50	-------	-------	112.43	121.90	-------	168.85	90.90	-------
81.5	14.32	1,204	10.43	6.47	12.62	82.6	51.3	3.31	3.69	89.5	4.56	2.33	51
77.2	13.43	1,060	9.5	5.9	11.8	76.6	46.9	3	3.40	80	4.2	2.05	43.8
91.3	14.90	1,325	11.3	7.1	13.6	91.1	55.9	3.70	4.15	100	5	2.55	56.2

California Indian crania, Santa Catalina Island

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
242,298	U. S. N. M.	Santa Catalina Island.	Adults		17.4	13.4	12.2	*77*

California Indian crania, San Nicholas Island

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
242,071	U. S. N. M.	San Nicholas Island.	Adult		19.6	13.4	13.4	*68.4*
242,085	do	do	do		19.4	13.9	13.1	*71.6*
242,087	do	do	do		18.6	13.4	13.4	*72.0*
242,083	do	do	do		18.5	13.4	12.4	*72.4*
242,084	do	do	do		19.2	14.1	12.7	*73.4*
242,082	do	do	Senile		19.4	14.3	12.6	*73.7*
242,077	do	do	Adult		18.2	13.5	12.7	*74.2*
242,072	do	do	do		18.0	13.6	12.9	*75.6*
242,081	do	do	do		18.8	14.4	13.2	*76.6*
242,069	do	do	do		18.2	14.1	13.0	*77.5*
242,080	do	do	do		18.3	14.8	13.2	*80.9*
					(11)	(11)	(11)	*(11)*
Totals					206.2	152.9	142.6	
Averages					*18.75*	*13.90*	*12.96*	*74.2*
Minimum					18.2	13.4	12.6	*68.4*
Maximum					19.6	14.8	13.4	*80.9*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
242,073	U. S. N. M.	San Nicholas Island.	Adult		18.2	13.4	12.2	*73.6*
242,086	do	do	do		17.9	13.4	12.6	*74.9*
242,079	do	do	do		18.0	13.5	12.8	*75.0*
242,070	do	do	do		18.1	13.6	13.0	*75.1*
242,089	do	do	do		18.1	13.6	11.8	*75.1*
242,090	do	do	do		18.6	14.5	12.3	*78.0*
242,088	do	do	do		18.2	14.2	12.8	*78.0*
242,066	do	do	do		17.9	14.2	12.4	*79.3*
146,177	do	do	do		17.0	13.7	12.8	*80.6*
242,068	do	do	do		17.0	13.7	12.0	*80.6*
242,067	do	do	do		17.8	14.7	12.2	*82.6*
242,078	do	do	do		16.9	14.0	11.8	*82.8*
242,074	do	do	do		18.4		13.1	
					(13)	(12)	(13)	*(12)*
Totals					232.1	166.5	161.8	
Averages					*17.85*	*13.88*	*12.45*	77.9
Minimum					16.9	13.4	11.8	*73.6*
Maximum					18.6	14.7	13.1	*82.8*

[1] Part damaged; measurement approximate.

California Indian crania, Santa Catalina Island

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
79.2	14.33	-------	-------	7	13	-------	*53.8*	3.65	4	*91.2*	5.55	2.35	*42.3*

California Indian crania, San Nicholas Island

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
81.2	15.47	1,520	-------	6.8	13.3	-------	*51.1*	3.35	4.00	*83.8*	5.15	2.8	*54.4*
78.7	15.47	1,560	12	7.2	13.4	*89.6*	*53.7*	3.55	3.83	*92.8*	5.3	2.5	*47.2*
83.8	15.13	1,430	11.3	6.7	[1] 13.1	*86.3*	*51.2*	3.60	3.70	*97.3*	4.9	2.5	*51.0*
77.7	14.77	1,360	[2] 10.7	7.0	13.3	*80.4*	*52.6*	3.70	4.00	*92.5*	5.4	2.5	*46.3*
76.3	15.33	1,540	12.3	7.4	14.6	*84.2*	*50.7*	3.75	4.10	*91.5*	5.6	2.2	*39.3*
74.8	15.43	1,500	-------	[1] 7.5	14.2	-------	*52.8*	3.55	4.05	*87.7*	[1] 5.6	[1] 2.6	*46.4*
80.1	14.47	1,400	11.8	[1] 7.3	13.7	*86.1*	*53.3*	3.55	3.80	*93.4*	5.5	2.4	*43.6*
81.6	14.83	1,290	12.2	7.5	13.3	*91.7*	*56.4*	3.40	3.80	*89.5*	5.2	2.6	*50*
79.5	15.47	1,550	12.3	7.6	-------	-------	-------	3.70	-------	-------	5.6	2.5	*44.6*
80.5	15.10	1,430	12.0	7.6	13.8	*87*	*55.1*	3.70	3.70	*100*	5.7	2.45	*43*
79.8	15.43	1,620	-------	-------	14.5	-------	-------	3.70	4.10	*90.2*	5.4	2.6	*48.2*
(11)	(11)	(11)	(8)	(10)	(10)	*(7)*	*(9)*	(11)	(10)	*(10)*	(11)	(11)	*(11)*
-------	166.90	16,200	94.6	72.6	137.2	-------	-------	39.55	39.08	-------	59.35	27.65	-------
79.4	*15.20*	*1,473*	*11.83*	*7.26*	*13.72*	*86.4*	*53*	*3.6*	*3.91*	*91.7*	*5.4*	*2.51*	*46.6*
74.8	14.47	1,290	10.7	6.7	13.1	*80.4*	*50.7*	3.35	3.7	*83.8*	4.9	2.2	*39.3*
83.8	15.47	1,620	12.3	7.6	14.6	*91.7*	*56.4*	3.75	4.1	*100.0*	5.7	2.8	*54.4*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
77.2	14.60	1,275	11.1	7.3	12.7	*87.4*	*57.5*	3.45	3.70	*93.2*	5.5	2.5	*45.4*
80.5	14.63	1,330	-------	-------	-------	-------	-------	3.50	3.90	*89.7*	5.0	2.6	*52*
81.3	14.77	1,395	-------	6.7	-------	-------	-------	3.45	4.05	*85.2*	5.1	2.5	*49.0*
82.0	14.90	1,360	-------	6.6	12.6	-------	*52.4*	3.50	3.70	*94.6*	4.9	2.4	*49*
74.4	14.50	1,335	-------	-------	13.2	-------	-------	3.45	3.80	*90.8*	4.7	2.4	*51.1*
74.3	15.13	1,465	-------	[1] 7.0	13.3	-------	*52.6*	3.70	3.93	*94.1*	5.1	2.4	*47.1*
79.0	15.07	1,445	11.3	7.2	13.3	*85*	*54.1*	3.60	3.80	*94.7*	5.0	2.5	*50*
77.3	14.83	1,370	-------	6.9	13.1	-------	*52.7*	3.30	3.60	*91.7*	4.8	2.7	*56.2*
83.4	14.50	1,400	-------	5.8	-------	-------	-------	3.20	-------	-------	4.45	2.2	*49.4*
78.2	14.23	1,255	-------	[1] 6.0	12.1	-------	*49.6*	3.20	3.50	*91.4*	4.6	2.4	*52.2*
75.1	14.90	1,390	-------	-------	-------	-------	-------	3.23	3.90	*82.8*	5.0	2.6	52
76.4	14.23	1,320	-------	6.5	12.7	-------	*51.2*	3.33	3.50	*95.1*	4.7	1.9	*40.4*
-------	-------	-------	-------	-------	-------	-------	-------	3.40	4.10	*82.9*	5.3	2.4	*45.3*
(12)	(12)	(12)	(2)	(9)	(8)	*(2)*	(7)	(13)	(12)	*(12)*	(13)	(13)	*(13)*
-------	176.29	16,340	22.4	60.0	103.0	-------	-------	44.31	45.48	-------	64.15	31.5	-------
78.2	*14.69*	*1,362*	*11.2*	*6.67*	*12.88*	*86.2*	*52.4*	*3.41*	*3.79*	*90.3*	*4.93*	*2.42*	*49.1*
74.3	14.23	1,255	-------	5.8	12.1	-------	*49.6*	3.2	3.5	*82.8*	4.45	1.9	*40.4*
83.4	15.13	1,465	-------	7.3	13.3	-------	*57.5*	3.7	4.1	*95.2*	5.5	2.7	*56.2*

[2] Teeth worn to gums.

California Indian crania, Santa Cruz Island

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
242,010	U. S. N. M.	Santa Cruz Island	Adult		19.2	13.8	13.0	*71.9*
242,002	do	do	do		18.5	13.3	13.3	*71.9*
242,018	do	do	do		18.6	13.4	13.2	*72.0*
242,006	do	do	do		18.8	13.6	13.2	*72.3*
241,961	do	do	do		17.9	13.1	12.8	*73.2*
241,969	do	do	do		18.8	13.8	12.9	*73.4*
241,945	do	do	do		18.2	13.4	13.0	*73.6*
241,947	do	do	do		18.4	13.6	13.2	*73.9*
241,998	do	do	do		18.8	13.9	12.4	*73.9*
241,949	do	do	do		18.1	13.4	13.0	*74.0*
242,050	do	do	do		18.9	14.0	13.1	*74.1*
241,966	do	do	do		18.0	13.4	12.9	*74.4*
242,009	do	do	do		[1] 19.0	14.2	13.2	*74.7*
241,954	do	do	do		18.8	14.2	13.4	*75.5*
241,916	do	do	do		18.4	13.9	13.0	*75.5*
241,921	do	do	do		17.2	13.0	12.5	*75.6*
241,919	do	do	do		18.2	13.8	12.8	*75.8*
241,927	do	do	do		18.2	13.8	13.4	*75.8*
241,953	do	do	do		18.2	13.8	13.0	*75.8*
242,043	do	do	do		19.0	14.4	13.6	*75.8*
241,918	do	do	do		19.2	14.6	13.6	*76.0*
241,941	do	do	do		18.4	14	12.8	*76.1*
241,940	do	do	do		18.8	14.4	12.8	*76.6*
241,988	do	do	do		18	13.8	13	*76.7*
242,017	do	do	do		18.2	14.0	12.5	*76.9*
242,051	do	do	do		18.2	14.0	13.6	*76.9*
242,024	do	do	do		18.6	14.3	13.3	*76.9*
241,939	do	do	do		18.4	14.2	13.8	*77.2*
241,983	do	do	Near senile		18.4	14.2	12.3	*77.2*
241,971	do	do	Adult		17.6	13.6	13.0	*77.3*
241,935	do	do	do		17.7	13.7	13.0	*77.4*
242,030	do	do	do		18.6	14.4	13.2	*77.4*
242,060	do	do	do		18.6	14.4	14.2	*77.4*
242,062	do	do	do		18.6	14.4	13.8	*77.4*
241,956	do	do	do		18.8	14.6	13.2	*77.7*
242,021	do	do	do		18.1	14.1	13.2	*77.9*
242,046	do	do	do		18.3	14.3	-------	*78.1*
241,958	do	do	do		18.4	14.4	13.6	*78.3*
242,057	do	do	do		18.4	14.4	-------	*78.3*
242,014	do	do	do		17.1	13.4	12.8	*78.4*
241,931	do	do	do		17.8	14.0	13.4	*78.6*
241,976	do	do	do		18.0	14.2	12.7	*78.9*
242,047	do	do	do		18.1	14.3	13.5	*79.0*
242,058	do	do	do		18.1	14.3	13.2	*79.0*
241,997	do	do	do		17.7	14	13.4	*79.1*
241,995	do	do	do		17.2	13.6	12.8	*79.1*
241,963	do	do	do		17.3	13.7	13	*79.2*
242,020	do	do	do		17.7	14.1	12.7	*79.7*
242,034	do	do	do		17.8	14.2	12.7	*79.8*
241,924	do	do	do		18	14.4	13.2	*80*
242,031	do	do	do		18	14.4	13.1	*80*
241,967	do	do	do		18.2	14.6	13	*80.2*
241,933	do	do	do		17.8	14.3	13.2	*80.3*
241,934	do	do	do		17.6	14.2	13.1	*80.7*
241,938	do	do	do		17.6	14.2	12.8	*80.7*
241,952	do	do	do		17.8	14.4	13	*80.9*
241,960	do	do	do		18.3	14.8	12.8	*80.9*
241,957	do	do	do		17.4	14.2	12.9	*81.6*
241,964	do	do	do		17.4	14.2	12.4	*81.6*
241,959	do	do	do		17.0	13.9	12.8	*81.8*
242,028	do	do	do		17.6	14.4	12.8	*81.8*
242,004	do	do	do	Very slight occipital compression.	17.3	14.2	12.4	*82.1*
242,045	do	do	Near adult		18.0	14.8	12.9	*82.2*
241,978	do	do	do		[2] 18.2	15.1	13.4	*83.0*

[1] Actual measurement, 19.4; 4 millimeters deducted because of a very pronounced occipital protuberance.

California Indian crania, Santa Cruz Island

MALE

Mean Height Index	Cranial Module	Capacity, in c. c (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
78.8	15.33	1,510	10.9	7.0	14.0	*77.9*	*50.0*	3.60	3.80	*94.7*	5.0	2.5	*50.0*
83.6	15.03	----	----	7.2	13.4	----	*53.7*	3.65	3.75	*97.3*	5.2	2.4	*46.2*
82.5	15.07	1,330	----	7.3	----	----	----	3.45	3.80	*90.8*	5.1	2.5	*49.0*
81.5	15.20	----	----	7.3	13.8	----	*52.9*	3.50	3.85	*90.9*	5.1	2.5	*49.0*
82.6	14.60	----	----	7.5	13.2	----	*56.8*	3.50	3.90	*89.7*	5.2	2.3	*44.2*
79.1	15.17	----	----	6.7	14.0	----	*47.9*	3.35	3.95	*84.8*	5.2	2.6	*50.0*
82.3	14.87	----	----	7.0	13.5	----	*51.8*	3.05	3.60	*84.7*	4.6	2.4	*52.2*
82.5	15.07	----	----	7.0	13.6	----	*51.2*	3.15	3.70	*85.1*	5.0	2.5	*50.0*
75.8	15.03	1,380	----	6.9	13.8	----	*50.0*	3.45	3.80	*90.8*	5.1	2.6	*51.0*
82.5	14.83	1,295	----	7.1	----	----	----	3.40	3.65	*93.2*	5.25	2.6	*49.5*
79.6	15.33	1,470	----	7.7	13.5	----	*57.0*	3.60	4.00	*90.0*	5.1	2.5	*49.0*
82.2	14.77	1,290	11.6	7.0	13.7	*84.7*	*51.1*	3.40	3.70	*91.9*	5.2	2.35	*45.2*
79.5	15.47	1,370	----	6.9	14.3	----	*48.3*	3.40	3.95	*86.1*	4.6	2.5	*54.4*
81.2	15.47	1,440	----	7.5	13.3	----	*56.4*	3.45	3.70	*93.2*	5.2	2.6	*50.0*
80.5	15.10	1,270	----	7.3	13.7	----	*53.3*	3.65	4.10	*88.5*	5.2	2.4	*46.2*
82.8	14.23	1,175	----	6.7	12.8	----	*52.3*	3.50	3.70	*94.6*	4.8	2.2	*45.8*
80.0	14.93	1,330	----	6.9	13.8	----	*50.0*	3.25	3.85	*84.4*	4.90	2.25	*45.9*
83.8	15.13	1,360	11.8	7.5	13.6	*86.8*	*55.2*	3.60	3.80	*94.7*	5.4	2.2	*40.7*
81.2	15.00	1,270	----	7.1	13.4	----	*53.0*	3.55	3.85	*92.5*	5.0	2.2	*44.0*
81.4	15.67	1,495	----	7.3	13.5	----	*54.1*	3.60	3.80	*94.7*	5.2	2.3	*44.2*
80.5	15.80	1,600	----	8.0	14.6	----	*54.8*	3.50	3.90	*89.7*	5.4	2.25	*41.7*
79	15.40	1,320	----	6.9	13.4	----	*51.5*	3.2	3.6	*88.9*	4.6	2.4	*52.2*
77.1	15.33	1,390	----	7.3	14.4	----	*50.7*	3.35	3.6	*93.1*	5.2	2.4	*46.1*
81.8	14.93	1,340	----	7.4	13.8	----	*53.6*	3.4	3.9	*87.2*	5.3	2.3	*43.4*
77.6	14.90	1,285	11.5	7.2	13.4	*85.8*	*53.7*	3.20	3.90	*82.0*	5.0	2.5	*50.0*
84.5	15.27	1,450	----	6.8	----	----	----	3.40	3.90	*87.2*	5.1	2.4	*47.1*
80.9	15.40	1,595	----	7.4	14.2	----	*52.1*	3.63	3.90	*93.1*	5.3	2.4	*45.3*
84.7	15.47	1,500	----	7.2	14.2	----	*50.7*	3.65	4.1	*89*	5	2.7	*54*
75.5	14.97	1,390	----	7.2	13.4	----	*53.7*	3.6	3.7	*97.3*	5	2.5	*50*
83.3	14.73	----	11.1	6.8	13.2	*84.1*	*51.5*	3.40	3.80	*89.5*	4.6	2.4	*52.2*
82.8	14.80	1,330	----	6.8	13.5	----	*50.4*	3.30	3.75	*88.0*	4.8	2.4	*50.0*
80.0	15.40	1,450	----	7.4	14.2	----	*52.1*	3.50	3.90	*89.7*	5.4	2.6	*48.2*
86.1	15.73	1,535	----	6.9	13.8	----	*50*	3.6	3.9	*92.3*	5	2.5	*50*
83.6	15.67	1,625	----	6.8	----	----	----	3.65	3.8	*96*	4.4	2.2	*50*
79	15.53	1,450	----	7.1	14.3	----	*49.6*	3.52	3.82	*92.1*	5.2	2.7	*51.9*
82.0	15.13	1,430	----	7.3	13.8	----	*52.9*	3.72	3.90	*95.4*	5.5	2.4	*43.6*
----	----	----	----	6.8	----	----	----	----	----	----	4.95	2.3	*46.5*
82.9	15.47	1,435	----	7.1	14.0	----	*50.7*	3.70	4.00	*92.5*	5.0	2.6	*52.0*
----	----	1,460	----	7.5	13.7	----	*54.7*	3.60	3.70	*97.3*	5.4	2.15	*39.8*
83.9	14.43	1,205	----	6.6	13.1	----	*50.4*	3.28	3.75	*87.5*	4.7	2.2	*46.8*
84.3	15.07	1,360	11.8	7.0	13.1	*90.1*	*53.4*	3.45	3.75	*92.0*	4.5	2.3	*51.1*
78.9	14.97	1,410	----	7.3	13.8	----	*52.9*	3.60	4.00	*90.0*	5.3	2.4	*45.3*
83.3	15.30	1,490	----	6.7	----	----	----	3.25	3.70	*87.8*	5.0	2.6	*52.0*
81.5	15.20	1,445	----	7.1	14.2	----	*50.0*	3.65	3.90	*93.6*	5.1	2.3	*45.1*
84.5	15.03	1,370	----	7.5	13.9	----	*54*	3.8	4.1	*92.7*	5.2	2.1	*40.4*
83.1	14.53	1,280	----	6.6	14	----	*47.1*	3.3	3.8	*86.8*	4.8	2.1	*43.8*
83.9	14.67	1,300	----	7.4	13.4	----	*55.2*	3.7	3.8	*97.4*	5.3	2.2	*41.5*
79.9	14.83	1,330	12.5	7.7	13.3	*94*	*57.9*	3.6	3.6	*98.6*	5.6	2.3	*41.1*
79.4	14.90	1,380	----	7.2	13.7	----	*52.6*	3.7	3.9	*94.9*	5.2	2.5	*48.1*
81.5	15.20	1,395	----	7	13.2	----	*53*	3.7	3.8	*97.4*	5	2.4	*48*
80.9	15.17	1,465	----	8	14.1	----	*56.7*	3.75	3.75	*100*	5.2	2.5	*48.1*
79.3	15.27	1,365	----	7	13.1	----	*53.4*	3.55	3.65	*97.1*	4.8	2.5	*52.1*
82.2	15.10	1,395	----	7.2	13.6	----	*52.9*	3.9	4.2	*92.9*	5.3	2.7	*50.9*
82.4	14.97	1,370	11.3	7	13.7	*82.5*	*51.1*	3.75	3.95	*94.9*	5	2.1	*42*
80.5	14.87	1,360	11.1	7.3	13.7	*81*	*53.3*	3.6	3.9	*92.3*	4.9	2.1	*42.9*
80.8	15.07	1,340	----	6.9	13.1	----	*52.7*	3.5	3.9	*89.7*	4.9	2.5	*51*
77.3	15.30	1,390	----	7.4	13.5	----	*54.8*	3.55	3.7	*95.9*	5	2.4	*48*
81.6	14.83	1,310	----	7.0	13.1	----	*53.4*	3.40	3.80	*89.5*	4.6	2.1	*45.6*
78.5	14.67	1,300	11.4	7.1	13.0	*87.7*	*54.6*	3.60	3.80	*94.7*	4.8	2.4	*50.0*
82.9	14.57	1,335	----	6.7	13.3	----	*50.4*	3.40	3.70	*91.9*	4.7	2.2	*46.8*
80.0	14.93	1,290	11.1	7.0	13.3	*83.5*	*52.6*	3.80	3.90	*97.4*	4.9	2.3	*46.9*
78.7	14.63	1,265	----	6.9	13.1	----	*52.7*	3.50	3.70	*94.6*	4.9	2.2	*44.9*
78.7	15.23	1,600	11.3	6.7	13.5	*83.7*	*49.6*	3.50	3.70	*94.6*	4.9	2.5	*51.0*
80.5	15.57	1,450	----	7.3	14.7	----	*49.7*	3.70	4.00	*92.5*	5.3	2.55	*48.1*

[2] Actual measurement, 18.4; 2 millimeters deducted because of a pronounced occipital protuberance.

California Indian crania, Santa Cruz Island—Continued

MALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim	Basion-Bregma height	*Cranial Index*
241,999	U. S. N. M.	Santa Cruz Island	Near adult		18.4	15.3	13.2	*83.2*
242,053	do	do	do					
241,915	do	do	do		18		13	
					(66)	(65)	(64)	*(65)*
Totals					1,197.90	914.80	836	
Averages					*18.15*	*14.07*	*13.06*	*77.5*
Minima					17	13	12.3	*71.9*
Maxima					19.2	15.3	14.2	*83.2*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim	Basion-Bregma height	*Cranial Index*
242,048	U. S. N. M.	Santa Cruz Island	Adult		17.8	13	12.8	*73*
241,994	do	do	do		17.9	13.1	12.2	*73.2*
242,244	do	do	do		17.7	13.0	12.1	*73.4*
241,955	do	do	do		17.0	12.6	12.0	*74.1*
242,041	do	do	do		17.9	13.3	12.2	*74.3*
242,037	do	do	do		18.0	13.4	12.6	*74.4*
241,926	do	do	do		18.1	13.5	12.4	*74.6*
241,968	do	do	do		17.4	13.0	13.0	*74.7*
241,937	do	do	do		17.9	13.4	13.2	*74.9*
241,984	do	do	do		17.2	13.0	12.2	*75.6*
241,981	do	do	do		17.8	13.5	12.2	*75.8*
241,928	do	do	do		17.8	13.5	12.4	*75.8*
241,982	do	do	do		17.4	13.2	12.6	*75.9*
242,064	do	do	do		17.4	13.3	12.1	*76.4*
242,027	do	do	do		17.0	13.0	11.4	*76.5*
242,001	do	do	do		17.0	13.0	12.4	*76.5*
242,035	do	do	do		17.6	13.5	13.0	*76.7*
242,011	do	do	do		17.7	13.6	12.1	*76.8*
242,007	do	do	do		17.3	13.3	12.9	*76.9*
241,920	do	do	Very near adult.		16.9	13.0	11.6	*76.9*
242,228	do	(Santa Rosa Island)	Adult		17.4	13.4	12.6	*77.0*
241,925	do	Santa Cruz Island	do		17.4	13.4	12.8	*77.0*
242,000	do	do	do		17.8	13.7	12.4	*77.0*
241,987	do	do	do		17.0	13.1	12.3	*77.1*
242,005	do	do	do		17.2	13.3	12.4	*77.3*
241,973	do	do	do		17.3	13.4	12.4	*77.5*
241,929	do	do	do		17.8	13.8	12.2	*77.5*
242,026	do	do	do		17.0	13.2	13.1	*77.6*
241,948	do	do	do		17.5	13.6		*77.7*
241,992	do	do	Very near adult.		17.1	13.3	12.8	*77.8*
242,029	do	do	do		17.6	13.7	12.8	*77.8*
243,939	do	do	Adult		17.2	13.4	12.6	*77.9*
241,970	do	do	do		16.9	13.2	11.9	*78.1*
241,985	do	do	do		17.9	14	12.5	*78.2*
241,932	do	do	do		17.4	13.6	12.4	*78.2*
241,996	do	do	do		16.6	13	13.3	*78.3*
242,036	do	do	do		16.7	13.1	12.2	*78.4*
241,951	do	do	do		16.8	13.2	12.4	*78.6*
241,986	do	do	do		17.3	13.6	13	*78.6*
241,975	do	do	do		17	13.4	12.6	*78.8*
242,016	do	do	do		17.5	13.8	12.8	*78.9*
242,054	do	do	do		17.7	14	12.6	*79.1*
242,059	do	do	do		16.9	13.4	13	*79.3*
242,044	do	do	do		17.4	13.8		*79.3*
241,972	do	do	do		17.4	13.8	12.4	*79.3*
241,989	do	do	do		17.5	13.9	12.6	*79.4*
241,923	do	do	do		16.6	13.2	12.7	*79.5*
242,008	do	do	do		16.6	13.2	12.8	*79.5*
242,274	do	do	Very near adult.		17.6	14.0	12.9	*79.6*
242,033	do	do	Adult		16.9	13.5	12.8	*79.9*
241,990	do	do	do		16.9	13.5	12.6	*79.9*
241,962	do	do	do		17.4	13.9	12.6	*79.9*
242,052	do	do	do		18	14.4	12.2	*80*

[1] Naso-frontal suture very irregular.

California Indian crania, Santa Cruz Island—Continued

MALE—Continued

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
78.3	15.63	1,670	-------	6.6	14.2	-------	*46.5*	3.75	3.95	*94.9*	4.7	2.3	*48.9*
-------	-------	-------	12.2	7.5	-------	-------	-------	3.75	3.85	*97.4*	5.4	2.3	*42.6*
-------	-------	-------	-------	6.9	-------	-------	-------	-------	-------	-------	-------	-------	-------
(63)	(63)	(57)	(13)	(67)	(59)	*(12)*	*(59)*	(65)	(65)	*(65)*	(66)	(66)	*(66)*
-------	951.17	79,440	149.60	477.40	805.50	-------	-------	229.05	248.92	-------	332.50	157.55	-------
81.1	*15.10*	*1,394*	*11.51*	*7.12*	*13.65*	*85*	*52.3*	*3.52*	*3.83*	*92*	*5.04*	*2.39*	*47.4*
75.5	14.23	1,175	10.9	6.6	12.8	*77.9*	*46.5*	3.05	3.6	*82*	4.4	2.1	*39.8*
86.1	15.80	1,670	12.5	8	14.7	*94*	*57.9*	3.9	4.2	*100*	5.6	2.7	*54.4*

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total*	*Facial Index, upper*	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
83.1	14.53	1,300	-------	6.9	12.9	-------	*53.5*	3.4	3.8	*89.5*	4.6	2.3	*50*
78.7	14.40	1,235	-------	6.4	12.6	-------	*50.8*	3.20	3.50	*91.4*	4.6	2.4	*52.2*
78.8	14.27	1,290	-------	6.6	13.0	-------	*50.8*	3.50	3.80	*92.1*	4.5	2.3	*51.1*
81.1	13.87	1,050	-------	[1] 6.2	12.2	-------	*50.8*	3.25	3.50	*92.9*	[1] 4.2	2.2	*52.4*
78.2	14.47	1,255	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------
80.2	14.67	1,290	10.8	7.2	12.9	*83.7*	*55.8*	3.60	3.60	*100*	4.8	2.2	*45.8*
78.5	14.67	1,205	-------	6.8	12.6	-------	*54.0*	3.40	3.60	*94.4*	4.5	2.3	*51.1*
85.5	14.47	1,275	-------	6.4	13.1	-------	*48.8*	3.30	3.55	*92.8*	4.6	1.9	*41.3*
84.4	14.83	1,310	10.3	6.5	12.1	*85.1*	*53.7*	3.30	3.60	*91.7*	4.5	2.2	*48.9*
80.8	14.13	1,210	-------	6.3	12.3	-------	*51.2*	3.17	3.70	*85.7*	4.65	2.3	*49.5*
78	14.50	1,210	-------	7.1	13.0	-------	*54.6*	3.40	3.70	*91.9*	4.8	2.4	*50*
79.2	14.57	1,220	10.8	6.4	12.8	*84.4*	*50*	3.50	3.60	*97.2*	4.4	2.45	*55.7*
82.4	14.40	1,160	-------	-------	13.1	-------	-------	3.67	3.70	*99.2*	4.9	2.3	*46.9*
78.8	14.27	1,200	-------	6.5	-------	-------	-------	3.40	3.70	*91.9*	4.7	2.3	*48.9*
76	13.80	1,110	-------	6.2	11.7	-------	*53*	3.40	3.50	*97.1*	4.3	2.3	*53.5*
82.7	14.13	1,240	10.5	6.4	11.9	*88.2*	*53.8*	3.40	3.60	*94.4*	4.4	2.1	*47.7*
83.6	14.70	1,240	-------	6.6	13.1	-------	*50.4*	3.60	3.80	*94.7*	4.6	2.4	*52.2*
77.3	14.47	1,280	-------	6.6	12.5	-------	*52.8*	3.10	3.70	*83.8*	4.7	2.45	*52.1*
84.3	14.50	1,205	-------	6.6	12.5	-------	*52.8*	3.65	3.65	*100*	4.7	2.3	*48.9*
77.6	13.83	1,090	-------	6.0	11.9	-------	*50.4*	3.10	3.60	*86.1*	4.6	2.4	*52.2*
81.8	14.47	1,220	11.2	6.8	13.2	*84.8*	*51.5*	3.47	3.95	*87.8*	4.8	2.5	*52.1*
83.1	14.53	1,280	-------	6.5	12.4	-------	*52.4*	3.30	3.75	*88.0*	4.5	2.2	*48.9*
78.7	14.63	1,260	-------	6.3	12.3	-------	*51.2*	3.25	3.50	*92.9*	4.4	2.1	*47.7*
81.7	14.13	1,150	-------	7.0	12.9	-------	*54.3*	3.63	3.70	*98.1*	4.7	2.4	*51.1*
81.3	14.30	1,280	-------	6.0	12.5	-------	*48*	3.15	3.60	*87.5*	4.3	2.3	*53.5*
80.8	14.37	1,220	-------	6.4	12.1	-------	*52.9*	3.40	3.60	*94.4*	4.4	2.15	*48.9*
77.2	14.60	1,300	10.0	5.9	12.0	*83.3*	*49.2*	3.00	3.40	*88.2*	4.3	2.1	*48.8*
86.8	14.43	-------	-------	6.5	-------	-------	-------	3.20	3.50	*91.4*	4.6	1.9	*41.3*
-------	-------	1,275	-------	6.5	12.1	-------	*53.7*	3.10	3.70	*83.8*	4.4	2.2	*50*
84.2	14.40	1,205	-------	7.0	12.5	-------	*56*	3.55	3.57	*99.4*	5.1	2.6	*51*
81.8	14.70	1,345	-------	6.4	12.7	-------	*50.4*	3.40	3.80	*89.5*	4.8	2.15	*44.8*
82.4	14.40	1,280	-------	6.7	12.6	-------	*53.2*	3.40	3.70	*91.9*	4.8	2.30	*47.9*
79.1	14.00	1,085	-------	6.1	12.9	-------	*47.3*	3.33	3.6	*92.5*	4.6	2.35	*51.1*
78.4	14.80	1,260	-------	6.8	13.2	-------	*51.5*	3.5	3.7	*94.6*	4.8	2.6	*54.2*
80	14.47	1,200	11.5	7	13.2	*87.1*	*53*	3.5	3.9	*89.7*	4.6	2.6	*56.5*
89.9	14.30	1,200	-------	6.7	12.5	-------	*53.6*	3.4	3.7	*91.9*	4.65	2.4	*51.6*
81.9	14.00	1,090	-------	6.8	12.8	-------	*53.1*	3.3	3.6	*91.7*	4.9	2.5	*51*
82.7	14.13	1,210	-------	6.8	12.6	-------	*54*	3.35	3.55	*94.4*	4.9	2.25	*45.4*
84.1	14.63	1,290	-------	6.5	13	-------	*50*	3.63	3.75	*96.3*	4.5	2.6	*57.8*
82.9	14.33	1,170	-------	7.1	12.6	-------	*56.4*	3.4	3.7	*91.9*	4.8	2.4	*50*
81.8	14.70	1,145	-------	6.6	11.9	-------	*55.5*	3.4	3.4	*100*	4.6	2.1	*45.6*
79.5	14.77	1,300	-------	-------	-------	-------	-------	3.4	3.7	*91.9*	4.75	2.55	*53.7*
85.8	14.43	-------	-------	6.5	13	-------	*50*	3.4	3.65	*93.2*	4.6	2.3	*50*
-------	-------	1,285	-------	7.6	13.0	-------	*58.5*	3.50	3.60	*97.2*	5.0	2.2	*44.0*
79.5	14.53	1,315	-------	6.7	-------	-------	-------	3.50	3.80	*92.1*	4.6	2.2	*47.8*
80.2	14.67	1,200	-------	[2] 6.3	13.0	-------	*48.5*	3.48	3.65	*95.3*	4.6	2.2	*47.8*
85.2	14.17	1,230	-------	6.8	12.7	-------	*53.5*	3.40	3.70	*91.9*	4.9	2.3	*46.9*
85.9	14.20	1,270	-------	6.6	[2] 12.6	-------	*52.4*	3.50	3.80	*92.1*	4.8	2.3	*47.9*
81.6	14.83	1,430	-------	6.7	12.6	-------	*53.2*	3.60	3.70	*97.3*	5.0	2.3	*46.0*
84.2	14.40	1,190	-------	6.7	12.2	-------	*54.9*	3.25	3.5	*92.9*	4.4	2.4	*54.6*
82.9	14.33	1,170	-------	6.4	13.1	-------	*48.8*	3.5	3.8	*92.1*	4.5	2.5	*55.6*
80.5	14.63	1,250	11.2	7	13.1	*85.5*	*53.4*	3.5	3.9	*89.7*	4.7	2.3	*48.[illegible]*
75.3	14.87	1,270	-------	7.1	13	-------	*54.6*	3.5	3.8	*92.1*	5	2.5	*50*

[2] Part broken; measurement approximate.

California Indian crania, Santa Cruz Island—Continued

FEMALE—Continued

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
242,061	U. S. N. M	Santa Cruz Island	Adult		17.2	13.8	13.1	*80.2*
241,965	do	do	do		17.2	13.8	12.4	*80.2*
241,980	do	do	do		17.4	[1] 14	12.8	*80.5*
241,936	do	do	do		17	13.7	12.8	*80.6*
242,040	do	do	do		17.1	13.8	12.6	*80.7*
242,055	do	do	Senile or near.		16.7	13.5	12.6	*80.8*
241,917	do	do	Adult		17.4	14.1	13.1	*81*
241,977	do	do	do		16.5	13.4	12.6	*81.2*
241,922	do	do	Senile		17.0	13.8	12.2	*81.2*
241,993	do	do	Adult		16.6	13.5	12.1	*81.3*
242,038	do	do	do		16.6	13.5	11.8	*81.3*
241,963	do	do	do		17.2	14	12.2	*81.4*
241,991	do	do	do		17.2	14	12.7	*81.4*
242,003	do	do	do		17	13.9	12.6	*81.8*
242,022	do	do	do		16.5	13.6	12.1	*82.4*
241,974	do	do	do		17.6	14.6	12.4	*83*
					(69)	(69)	(67)	*(69)*
Totals					1,192.30	932	838.20	
Averages					*17.28*	*13.51*	*12.51*	*78.2*
Minima					16.5	12.6	11.4	*73*
Maxima					18.1	14.6	13.3	*83*

[1] Right side of skull damaged; measurement approximate.

California Indian crania, San Miguel Island

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
242,276	U. S. N. M	San Miguel Island	Adult		18.5	14		*75.7*
242,251	do	do	do		18.2	13.9		*76.4*
242,310	do	do	do		18.5	14.2	12.3	*76.8*
242,262	do	do	do		18.7	14.4		*77*
242,267	do	do	do		17.8	13.8	13	*77.5*
242,317	do	do	do		17.6	13.9	12.5	*79*
242,275	do	do	do		17.3	14.1	12.6	*81.5*
242,307	do	do	do	Slight occipital flattening.	17.6	14.7	12.2	*83.5*
242,257	do	do	do					
242,314	do	do	do					
242,313	do	do	do				12.6	
					(8)	(8)	(6)	(8)
Totals					144.20	113	75.20	
Averages					*18.02*	*14.12*	*12.53*	*78.4*
Minima					17.3	13.8	12.2	*75.7*
Maxima					18.7	14.7	13	*83.5*

California Indian crania, Santa Cruz Island—Continued

FEMALE—Continued

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	Facial Index, total $\left(\frac{a\times100}{c}\right)$	Facial Index, upper $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	Orbital Index, mean	Nose, Height	Nose, Breadth maxim.	Nasal Index
84.5	14.70	1,300	11	6.7	---	---	---	3.3	3.6	91.7	4.8	2.3	47.9
80	14.47	---	---	6.1	[2] 12.8	---	47.7	3.3	3.6	91.7	4.3	2.3	53.5
81.5	14.73	1,230	---	6.2	---	---	---	3.6	3.7	97.3	4.9	2.15	43.9
83.4	14.50	1,250	---	---	12.9	---	---	3.8	3.7	102.7	4.9	2.1	42.9
81.6	14.50	1,300	---	6.5	12.5	---	52	3.4	3.6	94.4	4.7	2.1	44.7
83.4	14.27	1,240	---	---	13.7	---	---	3.55	3.6	98.6	4.9	2.25	45.4
83.2	14.87	1,240	---	7	12.6	---	55.6	3.45	3.45	100	4.9	2.3	46.9
84.3	14.17	1,090	---	6.9	12.6	---	54.8	3.30	3.60	91.7	4.8	2.3	47.9
79.2	14.33	1,150	---	---	---	---	---	3.30	3.60	91.7	4.5	2.1	46.7
80.4	14.07	1,180	---	6.8	12.6	---	54	3.45	3.65	94.5	4.9	2.1	42.9
78.4	13.97	1,090	---	6.9	12.6	---	54.8	3.50	3.60	97.2	4.6	2.4	52.2
78.2	14.47	1,285	10	6	13.2	75.8	45.4	3.15	3.6	87.5	4.2	2.3	54.8
81.4	14.63	1,390	---	6.8	12.5	---	54.4	3.5	3.7	94.6	4.8	2.3	47.9
81.6	14.50	1,230	---	6.9	---	---	---	3.3	3.8	86.8	4.6	2.2	47.8
80.4	14.07	1,200	---	6.4	12.5	---	51.2	3.5	3.45	101.5	4.6	2.2	47.8
77	14.87	1,325	11.1	6.8	13.2	84.1	51.5	3.47	3.57	97.2	4.7	2.3	48.9
(67)	(67)	(66)	(11)	(63)	(60)	(10)	(57)	(68)	(68)	(68)	(68)	(68)	(68)
---	966.75	81,250	118.40	416.50	760.20	---	---	231.40	248.29	---	316.45	155.95	---
81.3	14.43	1,231	10.76	6.61	12.67	84.2	52.3	3.40	3.65	93.2	4.65	2.29	49.3
75.3	13.80	1,050	10	5.9	11.7	75.8	45.4	3	3.4	83.8	4.2	1.9	41.3
89.9	14.87	1,430	11.5	7.6	13.7	88.2	58.5	3.8	3.95	102.7	5.1	2.6	57.8

California Indian crania, San Miguel Island

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	Facial Index, total $\left(\frac{a\times100}{c}\right)$	Facial Index, upper $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	Orbital Index, mean	Nose, Height	Nose, Breadth maxim.	Nasal Index
---	---	1,460	---	6.9	13.4	---	51.5	3.55	3.9	91	4.8	2.2	45.8
---	---	1,380	---	7.3	13.3	---	54.9	3.7	3.8	97.4	5.2	2.3	44.2
75.2	15.00	1,510	12	7.3	13.9	86.3	52.5	3.9	4	97.5	5	2.4	48
82.3	14.87	1,330	---	7.4	13.6	---	54.4	3.6	4	90	5	2.2	44
79.4	14.67	---			12.8	---	---		---	---	---	---	---
80.2	14.67	1,380	---	6.9	13.1	---	52.7	3.35	3.65	91.8	4.8	2.1	43.8
75.5	14.83	1,365	---	6.4	13.8	---	46.4	3.5	3.8	92.1	4.7	2.2	46.8
---	---	---	---	7.2	13.9	---	51.8	3.5	3.8	92.1	5.1	2.4	47.1
---	---	---	---	---	---	---	---	3.7	3.85	95.6	5	2.5	50
---	---	---	---	7.2	13.2	---	54.6	3.7	4	92.5	4.6	2.4	52.2
(5)	(5)	(6)	---	(8)	(9)	---	(8)	(9)	(9)	(9)	(9)	(9)	(9)
---	74.04	8,425	---	56.60	121	---	---	32.50	34.80	---	44.20	20.70	---
78.5	14.81	1,404	---	7.07	13.44	---	52.3	3.61	3.87	93.4	4.91	2.3	46.8
75.2	14.67	1,330	---	6.4	12.8	---	46.4	3.35	3.65	90	4.6	2.1	43.8
82.3	15.00	1,510	---	7.4	13.9	---	54.9	3.9	4	97.5	5.2	2.5	52.2

California Indian crania, San Miquel Island—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
242, 309	U. S. N. M.	San Miguel Island.	Adult		17.6	13.5	12.8	*76.7*
242, 270	do	do	do		17.8	13.8	12.8	*77.5*
242, 268	do	do	do		17.2	13.4	12	*77.9*
242, 315	do	do	do		17.2	13.4	12.4	*77.9*
242, 316	do	do	do		17.5	13.7	12.7	*78.3*
242, 250	do	do	do		17.5	13.8		*78.9*
242, 264	do	do	do		17.4	13.8	12.4	*79.3*
242, 271	do	do	do		17.3	13.8	12.6	*79.8*
242, 249	do	do	do		17.4	14	12.2	*80.5*
242, 311	do	do	do		16.6	13.5	12.2	*81.3*
242, 318	do	do	do		17.2	14.1	13.1	*82*
242, 272	do	do	do		16.8	14	12.5	*83.3*
242, 249	do	do	do		16.8	14.2	13	*84.5*
242, 260	do	do	do		17.6		13.1	
					(14)	(13)	(13)	*(13)*
Totals					241.90	179	163.80	
Averages					*17.28*	*13.77*	*12.60*	*79.8*
Minima					16.6	13.4	12	*76.7*
Maxima					17.8	14.2	13.1	*84.5*

[1] Measurement approximate.

California Indian crania, Santa Rosa Island

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
242, 230	U. S. N. M.	Santa Rosa Island	Near senile		18.4	13.4	13.2	*72.8*
242, 207	do	do	Adult		18.3	13.9	12.8	*76*
242, 214	do	do	do		18.4	14	13.1	*76.1*
242, 237	do	do	do		17.7	13.5	13.3	*76.3*
242, 208	do	do	do		17.6	13.6	12.8	*77.3*
242, 204	do	do	do		17.9	13.9	13.3	*77.6*
242, 220	do	do	do		18	14	12.9	*77.8*
146, 189	do	do	do		18.2	14.4	12.8	*79.1*
242, 216	do	do	do		17.9	14.2	12.8	*79.3*
242, 240	do	do	do		17.6	14	12.8	*79.6*
242, 199	do	do	do		17.6	14.1	13	*80.1*
242, 232	do	do	do		17.8	14.3	12.2	*80.3*
242, 218	do	do	do		17	13.7	13.2	*80.6*
242, 219	do	do	do		18.1	14.6	12.9	*80.7*
242, 233	do	do	do		17.7	14.3	13.5	*80.8*
242, 197	do	do	do		17.4	14.1	12.8	*81*
242, 210	do	do	do	Very slight asymmetry.	17.6	14.5	12.5	*82.4*
242, 225	do	do	do	do	18	14.9	13.3	*82.8*
242, 200	do	do	do					
242, 209	do	do	do		18.1		13.2	
242, 221	do	do	do	Very slight asymmetry.	18.8		14	
242, 247	do	do	do					
					(20)	(18)	(20)	*(18)*
Totals					358.10	253.40	260.40	
Averages					*17.90*	*14.08*	*13.02*	*78.9*
Minina					17	13.4	12.2	*72.8*
Maxima					18.8	14.9	14	*82.8*

California Indian crania, San Miguel Island—Continued

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
82.3	14.63	1,390	-------	6.6	12.6	-------	52.4	3.5	3.65	95.9	4.5	2	44.4
81	14.80	1,345	-------	6.7	12.6	-------	53.2	3.3	3.7	89.2	4.7	2	42.6
78.4	14.20	1,190	-------	6.5	12.5	-------	52	3.3	3.65	90.9	4.7	2.1	44.7
81	14.33	1,265	-------	6.6	-------	-------	-------	3.35	3.6	93.1	4.5	2.3	51.1
81.4	14.63	1,250	-------	6.6	12.6	-------	52.4	3.4	3.7	91.9	4.6	2.4	52.2
-------	-------	-------	-------	-------	-------	-------	-------	3.6	4	90	4.8	2.4	50
79.5	14.53	-------	-------	6.5	12.9	-------	50.4	3.3	3.6	91.7	4.4	2.1	47.7
81	14.57	1,310	-------	6.7	-------	-------	-------	3.5	3.8	92.1	4.7	2.3	48.9
77.7	14.53	1,340	10.2	6.1	[1] 12.7	80.3	48	3.15	3.8	82.9	4.5	2.5	55.6
81.1	14.10	1,190	-------	6.5	12.4	-------	52.4	3.4	3.6	94.4	4.6	1.9	41.3
83.7	14.80	1,365	-------	6.9	12.7	-------	54.3	3.4	3.7	91.9	4.7	2.2	46.8
81.2	14.43	1,245	-------	6.7	12.4	-------	54	3.5	3.7	94.6	4.6	2.1	45.6
83.9	14.67	1,340	10.2	6.1	12.7	80.3	48	3.15	3.8	82.9	4.5	2.5	55.6
-------	-------	-------	-------	6.5	-------	-------	-------	3.35	3.8	88.2	4.5	2.2	48.9
(12)	(12)	(11)	(2)	(13)	(10)	(2)	(10)	(14)	(14)	(14)	(14)	(14)	(14)
-------	174.22	14,230	20.4	85	126.10	-------	-------	47.20	52.10	-------	64.30	31	-------
81	14.52	1,294	10.2	6.54	12.61	80.3	51.7	3.37	3.72	90.6	4.59	2.21	48.2
77.7	14.10	1,190	-------	6.1	12.4	-------	48	3.15	3.6	82.9	4.4	1.9	41.3
83.9	14.80	1,390	-------	6.9	12.9	-------	54.3	3.6	4	95.9	4.8	2.5	55.6

California Indian crania, Santa Rosa Island

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a\times100}{c}\right)$	*Facial Index, upper* $\left(\frac{b\times100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
83	15.00	1,345	-------	-------	13.4	-------	-------	3.45	4	86.2	4.7	2.3	48.9
79.5	15.00	1,400	-------	7.1	-------	-------	-------	3.75	4.20	89.3	5	2.3	46
80.9	15.17	1,395	-------	7.8	14.2	-------	54.9	3.7	3.83	96.6	5.8	2.6	44.8
85.3	14.83	1,370	-------	6.8	13.7	-------	49.6	3.4	3.8	89.5	5	2.5	50
82	14.67	1,345	11.5	6.9	13.6	84.6	50.7	3.8	3.9	97.4	5	2.25	45
83.6	15.03	1,500	11.3	6.8	13.6	83.1	50	3.15	3.75	84	4.5	2.4	53.3
80.6	14.97	1,540	-------	7.2	13.8	-------	52.2	3.6	4	90	5.1	2.3	45.1
78.5	15.13	1,400	-------	7	13.6	-------	51.2	3.55	3.6	98.6	4.8	2.5	52.1
79.8	14.97	1,340	11.4	7.1	-------	-------	-------	3.35	3.8	88.2	5	2.3	46
81	14.80	1,320	-------	7	13.1	-------	53.4	3.45	3.7	93.2	4.9	2.5	51
82	14.90	1,340	11.2	6.9	12.5	89.6	55.2	3.45	3.55	96.9	4.7	2.2	46.8
76	14.77	1,380	-------	7	13.3	-------	52.6	3.35	4	83.8	5.1	2.6	51
86	14.63	1,365	11.9	7	14.1	84.4	49.6	3.7	3.9	94.9	4.9	2.3	46.9
78.9	15.20	1,520	12.5	7.6	14.6	85.6	52.1	3.7	4.05	91.4	5.2	2.5	48.1
84.4	15.17	1,450	11.2	7.1	13.1	85.5	54.2	3.5	3.9	89.7	4.9	2.1	42.9
81.3	14.77	1,390	11.5	6.8	13.4	85.8	50.8	3.45	3.8	90.8	4.9	2	40.8
77.9	14.87	1,470	-------	7.1	13.2	-------	53.8	3.52	3.8	92.6	5.1	2.4	47.1
80.9	15.40	1,500	11.4	7	-------	-------	-------	3.65	3.95	92.4	4.9	2.4	49
-------	-------	-------	-------	7.1	-------	-------	-------	3.4	3.68	93	5	2.4	48
-------	-------	-------	12.1	7.5	14	86.4	53.6	3.55	4	88.8	5.3	2.5	47.2
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	4.9	2.5	51
-------	-------	-------	-------	7	-------	-------	-------	3.55	3.7	95.9	5	2.1	42
(18)	(18)	(18)	(10)	(20)	(16)	(8)	(15)	(21)	(21)	(21)	(22)	(22)	(22)
-------	269.28	25,370	116	141.80	217.20	-------	-------	74.02	80.91	-------	109.70	51.95	-------
81.2	14.96	1,409	11.6	7.09	13.57	85.6	52.3	3.52	3.85	91.5	5	2.36	47.4
76	14.63	1,320	11.2	6.8	12.5	83.1	49.6	3.15	3.55	83.8	4.5	2	40.8
86	15.40	1,540	12.5	7.8	14.6	89.6	55.2	3.8	4.2	98.6	5.8	2.6	53.3

California Indian crania, Santa Rosa Island—Continued

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
242, 223	U. S. N. M.	Santa Rosa Island	Adult		18.2	13.9	12.2	*76.4*
242, 205	do	do	do		17.6	13.8	12.5	*78.4*
242, 196	do	do	do		16.8	13.2	12.6	*78.6*
242, 202	do	do	do		17.3	13.6	12.1	*78.6*
242, 213	do	do	do		17.2	13.6	12	*79.1*
242, 194	do	do	do		17.2	13.7	12.7	*79.6*
242, 241	do	do	do		17.6	14	12.8	*79.6*
242, 195	do	do	do		18	14.4	12.4	*80*
242, 231	do	do	do		17.5	14	12	*80*
242, 217	do	do	do		16.7	13.4	12.8	*80.2*
242, 234	do	do	do		17.2	13.9	13	*80.8*
242, 245	do	do	do		16.8	13.6	12.1	*81*
242, 215	do	do	do		17	13.8	13	*81.2*
242, 203	do	do	do		17.1	13.9	12.4	*81.3*
242, 227	do	do	do		16.3	13.4	12.1	*82.2*
242, 226	do	do	do		17	14.1	12	*82.9*
242, 211	do	do	do		17.4	14.5	13.1	*83.3*
242, 198	do	do	do		17	14.2	12.4	*83.5*
242, 224	do	do	do		16.4	13.9	12	*84.8*
242, 222	do	do	do		16.8		11.6	
242, 229	do	do	do		16.7			
242, 246	do	do	do		17.3			
242, 248	do	do	do		18		12.3	
					(23)	(19)	(21)	*(19)*
Totals					395.10	262.90	260.10	
Averages					*17.18*	*13.84*	*12.39*	*80.6*
Minima					16.3	13.2	11.6	*76.4*
Maxima					18.2	14.5	13.1	*84.8*

[1] Part damaged; measurement approximate.

Southern California Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
225, 013	U. S. N. M.	Tule River	Adult		18.1	13.45	13	*74.3*
242, 288	do	San Luis Obispo Bay.	do		17.8	14.2		*79.8*
242, 293	do	do	do					
					(2)	(2)		*(2)*
Totals					35.9	27.65		
Averages					*17.95*	*13.82*		*77*

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
242, 286	U. S. N. M.	San Luis Obispo Bay.	Adult		18.2	14.1	13	*77.5*
242, 279	do	do	do		17	13.2	12.4	*77.6*
242, 293	do	do	do	Very slight occipital compression.	16.8	13.1		*78*
242, 290	do	do	do		17	13.4		*78.8*
242, 284	do	do	do		17.6	14	13.4	*79.6*
242, 282	do	do	do		17.2	13.8	12.6	*80.2*
242, 292	do	do	do		17.2	14.1		*82*
					(7)	(7)	(4)	(7)
Totals					121	95.70	51.40	
Averages					*17.29*	*13.67*	*12.85*	*79.1*

[1] Part damaged; measurement approximate.

California Indian crania, Santa Rosa Island—Continued

FEMALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
76.	14.77	1,440	11.2	6.9				3.5	3.77	*92.9*	4.9	2.3	*46.9*
79.6	14.63	1,265	11.5	7.5	12.9	*89.2*	*58.1*	3.5	3.8	*92.1*	4.9	2.3	*46.9*
84	14.20	1,160	10.3	6.3	12.4	*83.1*	*50.8*	3.2	3.6	*88.9*	4.4	2.15	*48.9*
78.3	14.33	1,295		6.9	12.9		*53.5*	3.7	3.75	*98.7*	4.7	2.2	*46.8*
77.9	14.27	1,225		6.8	12.5		*54.4*	3.55	3.7	*95.9*	4.7	1.95	*41.5*
82.2	14.53	1,325	11.3	6.8	13	*86.9*	*52.3*	3.65	3.85	*94.8*	4.7	2.3	*48.9*
81	14.80	1,340	10.1	6.3	13.1	*77.1*	*48.1*	3.7	3.8	*97.4*	4.9	2.3	*46.9*
76.5	14.93	1,480	10.7	6.7	13.2	*81.1*	*50.8*	3.3	3.6	*91.7*	4.8	2.2	*45.8*
76.2	14.50	1,295			13						4.5	2.3	*51.1*
85	14.30	1,270	10.9	6.7	12.6	*86.5*	*53.2*	3.5	3.7	*94.6*	4.6	1.8	*39.1*
83.6	14.70	1,370	11.8	7.2				3.6	3.8	*94.7*	4.8	2.5	*52.1*
79.6	14.17	1,220	10.6	6.9	12.4	*85.5*	*55.6*	3.62	3.7	*97.8*	5	2.2	*44*
84.4	14.60	1,290	11.7	7.3	12.6	*92.9*	*57.9*	3.35	3.6	*93.1*	4.8	2.2	*45.8*
80	14.47	1,225	11.5	7.3	12.2	*94.3*	*59.8*	3.55	3.55	*100*	4.9	2.2	*44.9*
81.5	13.93	1,160		6.2	12.3		*50.4*	3.15	3.60	*87.5*	4.2	1.9	*45.2*
77.2	14.33	1,250	10.3	6.6	12.9	*79.8*	*51.2*	3.4	3.65	*93.2*	4.7	2	*42.6*
82.1	15.00	1,390	10.2	6.8	13	*78.5*	*52.3*	3.4	3.7	*91.9*	4.9	2.2	*44.9*
79.5	14.53	1,250		[1]5.8	12.8		*45.3*	3.3	3.65	*90.4*	4.1	2.1	*51.2*
79.2	14.10	1,240		6.2	12		*51.7*	3.5	3.6	*97.2*	4.5	2.3	*51.1*
			10.5	6.3	12.9	*81.4*	*48.8*	3.5	3.9	*89.7*	4.2	2	*47.6*
			11	6.7				3.5	3.7	*94.6*	4.7	2.4	*51.1*
				6.6	12.7		*52*				4.6	2.3	*50*
(19)	(19)	(19)	(15)	(21)	(19)	*(12)*	*(18)*	(20)	(20)	*(20)*	(22)	(22)	*(22)*
	275.09	24,490	163.60	140.80	241.40			69.47	74.02		102.50	48.10	
80.2	*14.48*	*1,289*	*10.91*	*6.70*	*12.70*	*84.6*	*52.5*	*3.47*	*3.7*	*93.8*	*4.66*	*2.19*	*46.9*
76	13.93	1,160	10.1	5.8	12	*77.1*	*45.3*	3.15	3.55	*87.5*	4.1	1.8	*39.1*
85	15.00	1,480	11.8	7.5	13.2	*94.3*	*59.8*	3.7	3.9	*100*	5	2.5	*52.1*

Southern California Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper,* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height, mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
82.4	14.85	1,255		7.3	12.5		*58.4*	3.55	3.82	*92.9*	5.1	2.75	*53.9*
			12.6	7.8				3.7	3.85	*96.1*	5.7	2.2	*38.6*
				(2)				(2)	(2)	*(2)*	(2)	(2)	*(2)*
				15.1				7.25	7.67		10.8	4.95	
				7.55				*3.62*	*3.83*	*94.5*	*5.4*	*2.47*	*45.8*

FEMALE

80.5	15.10												
82.1	14.20	1,230		6.5	12.7		*51.2*	3.2	3.7	*86.5*	4.6	2.4	*52.2*
				6	12.6		*47.6*	3.1	3.5	*88.6*	4.1	2.1	*51.2*
		1,230		6.8	12.6		*47.6*	3.25	3.55	*91.5*	4.45	2.3	*51.7*
84.8	15.00	1,390		[1]6.6	[1]12.8		*51.6*	3.2	3.5	*91.4*	4.8	2.3	*47.9*
81.3	14.53	1,265		6.4	13.2		*48.5*	3.5	3.5	*100*	4.7	2.6	*55.3*
		1,410		6.8							4.75	2.5	*52.6*
(4)	(4)	(5)		(6)	(5)		*(5)*	(5)	(5)	*(5)*	(6)	(6)	*(6)*
	58.83	6,525		39.10	63.90			16.25	17.75		27.40	14.20	
82.2	*14.71*	*1,305*		*6.52*	*12.78*		*50.5*	*3.25*	*3.55*	*91.5*	*4.57*	*2.37*	*51.8*

Lower California Indian crania

MALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
148,213	U. S. N. M.	Espiritu Santo Island.	Adult		19.3	13	13	*67.4*
139,573	do	Angel Island	do		18.2	13.1	13	*72*
139,570	do	do	do		18.8	13.9	13.2	*73.9*
					(3)	(3)	(3)	(3)
Totals					56.3	40	39.2	
Averages					*18.77*	*13.33*	*13.07*	71

FEMALE

Catalogue No.	Collection	Locality	Approximate age of subject	Deformation	Diam. antero-posterior maxim. (glabella ad maximum)	Diam. lateral maxim.	Basion-Bregma height	*Cranial Index*
139,571	U. S. N. M.	Angel Island	Adult		17.7	13.5	13	*76.3*

Lower California Indian crania

MALE

Mean Height Index	Cranial Module	Capacity, in c. c. (Hrdlička's method)	Menton-Nasion Height (a)	Alveol. Pt.-Nasion Height (b)	Diam. Bizygomatic maxim. (c)	*Facial Index, total* $\left(\frac{a \times 100}{c}\right)$	*Facial Index, upper* $\left(\frac{b \times 100}{c}\right)$	Orbits—Height mean	Orbits—Breadth, mean	*Orbital Index, mean*	Nose, Height	Nose, Breadth maxim.	*Nasal Index*
80.5	15.10	1,420	11.6	7.2	-------	-------	-------	3.50	3.85	*90.9*	5.2	2.6	*50*
83.1	14.77	1,395	-------	7.3	13.8	-------	*52.9*	3.55	3.7	*95.9*	5.2	2.6	*50*
80.7	15.30	1,460	11.4	7	13.9	*82*	*50.4*	3.5	3.7	*94.6*	5.2	2.7	*51.9*
(3)	(3)	(3)	(2)	(3)	(2)	-------	(2)	(3)	(3)	(3)	(3)	(3)	(3)
-------	45.17	4,275	23	21.5	27.7	-------	-------	10.55	11.25	-------	15.6	7.9	-------
81.4	*15.06*	*1,425*	*11.5*	*7.17*	*13.85*	-------	*51.6*	*3.52*	*3.75*	*93.8*	*5.2*	*2.63*	*50.6*

FEMALE

83.3	14.73	1,315	-------	6.5	12.9	-------	*50.4*	3.4	3.6	*94.4*	4.8	2.8	*58.3*

California and Lower California: Summary of measurements

MALE

	Northern California	Konkan (Maidu)	San Francisco Bay and vicinity	Santa Barbara County	San Nicolas Island	Santa Cruz Island	San Miguel Island	Santa Rosa Island	Southern California	Lower California
Number of skulls	(4)	(4)	(31)	(48)	(11)	(66)	(9)	(22)	(2)	(3)
Vault:										
Length	18.06	18.5	18.23	17.94	18.75	18.15	18.02	17.90	17.95	18.77
Breadth	13.96	13.02	14.01	13.83	13.90	14.07	14.12	14.08	13.82	13.33
Height	13.09	12.8	13.66	13.17	12.96	13.06	12.53	13.02	-------	13.07
Cranial Index	*77.3*	*70.4*	*76.8*	*77.1*	*74.2*	*77.5*	*78.4*	*78.9*	*77*	*71*
Mean Height Index	*81.7*	*81.2*	*84.8*	*82.9*	*79.4*	*81.1*	*78.5*	*81.2*	-------	*81.4*
Module	15.04	14.78	15.29	15.02	15.20	15.10	14.81	14.96	-------	15.06
Capacity	1,348	1,257	1,372	1,390	1.473	1,394	1,404	1,409	-------	1,425
Face:										
M.-N. Height	11.95	-------	11.85	11.37	11.83	11.51	-------	11.6	-------	11.5
Alv. Pt.-N. Height	7.24	6.88	7.3	6.96	7.26	7.12	7.07	7.09	7.55	7.17
Breadth	13.6	-------	13.67	13.54	13.72	13.65	13.44	13.57	-------	13.85
Facial Index, total	*86.6*	-------	*85.7*	*83.3*	*86.4*	*85*	-------	*85.6*	-------	-------
Facial Index, upper	*53.2*	-------	*53.2*	*51.3*	*53*	*52.3*	*52.3*	*52.3*	-------	*51.6*
Orbits:										
Mean Height	3.47	3.35	3.46	3.45	3.6	3.52	3.61	3.52	3.62	3.52
Mean Breadth	3.89	3.8	3.84	3.83	3.91	3.83	3.87	3.85	3.83	3.75
Mean Index	*89.4*	*88.2*	*90.2*	*89.6*	*91.7*	*92*	*93.4*	*91.5*	*94.5*	*93.8*
Nose:										
Height	5.17	5.02	5.1	4.91	5.4	5.04	4.91	5	5.4	5.2
Breadth	2.35	2.36	2.46	2.38	2.51	2.39	2.3	2.36	2.47	2.63
Index	*45.4*	*47*	*48.2*	*48.4*	*46.6*	*47.4*	*46.8*	*47.4*	*45.8*	*50.6*

FEMALE

	Northern California	Konkan (Maidu)	Miscellaneous	San Francisco Bay and vicinity	Santa Barbara County	Santa Catalina Island	San Nicholas Island	Santa Cruz Island	San Miguel Island	Santa Rosa Island	Southern California
Number of skulls	(2)	(4)	(5)	(13)	(39)	(1)	(13)	(69)	(14)	(23)	(7)
Vault:											
Length	17.45	17.4	17.38	17.23	17.09	17.4	17.85	17.28	17.28	17.18	17.29
Breadth	13.9	13.32	13.78	13.37	13.41	13.40	13.88	13.51	13.77	13.84	13.67
Height	11.75	12.1	12.74	12.85	12.44	12.2	12.45	12.51	12.60	12.39	12.85
Cranial Index	*79.7*	*76.6*	*79.3*	*77.6*	*78.5*	*77*	*77.9*	*78.2*	*79.8*	*80.6*	*79.1*
Mean Height Index	*75*	*78.8*	*81.8*	*84.3*	*81.5*	*79.2*	*78.2*	*81.3*	*81*	*80.2*	*82.2*
Module	14.37	14.28	14.63	14.43	14.32	14.33	14.69	14.43	14.52	14.48	14.71
Capacity	1,237	1,229	1,297	1,167	1,204	-------	1,362	1,231	1,294	1,289	1,305
Face:											
M.-N. Height	-------	-------	10.6	11.14	10.43	-------	11.2	10.76	10.2	10.91	-------
Alv. P.-N. Height	6.85	6.18	6.82	6.72	6.47	7	6.67	6.61	6.54	6.70	6.52
Breadth	-------	12.6	13.17	12.88	12.62	13	12.88	12.67	12.61	12.7	12.78
Facial Index, total	-------	-------	-------	*86.9*	*82.6*	-------	*86.2*	*84.2*	*80.3*	*84.6*	-------
Facial Index, upper	-------	*49*	*52*	*52.2*	*51.3*	*53.8*	*52.4*	*52.3*	*51.7*	*52.5*	*50.5*
Orbits:											
Mean Height	-------	3.30	3.46	3.32	3.31	3.65	3.41	3.4	3.37	3.47	3.25
Mean Breadth	-------	3.62	3.78	3.79	3.69	4	3.79	3.65	3.72	3.7	3.55
Mean Index	-------	*91*	*91.5*	*87.6*	*89.5*	*91.2*	*90.3*	*93.2*	*90.6*	*93.8*	*91.5*
Nose:											
Height	4.97	4.55	4.96	4.77	4.56	5.55	4.93	4.65	4.59	4.66	4.57
Breadth	-------	2.49	2.44	2.37	2.33	2.35	2.42	2.29	2.21	2.19	2.37
Index	-------	*54.7*	*49.2*	*49.3*	*51*	*42.3*	*49.1*	*49.3*	*48.2*	*46.9*	*51.8*

CALIFORNIAN AND LOWER CALIFORNIAN TRIBES

1. The material from California shows considerable uniformity. The type is characterized as follows:

   The cephalic index ranges from dolicho- to meso-cephalic;
   The height of the vault is medium to submedium;
   In size the skull is rather small;
   The face is of medium dimensions;
   The orbits range about medium;
   The nasal index is submedium to medium.

2. The Lower Californians differ only by higher dolichocephaly.
3. The Maidu also, as far as represented, show higher dolichocephaly.
4. In general the Californians here represented are plainly of one type, with here and there secondary variations.
5. This type appears to be practically identical with that of the Shoshoneans.
6. No traces of any extraneous (non-Indian) type are perceptible.

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A NEW SEA STAR OF THE GENUS EVASTERIAS

By W. K. Fisher,
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Species of the genus *Evasterias* are confined to the intertidal zone and shallow water of the North Pacific, from the Okhotsk Sea to central California. The center of abundance is the region between southern Alaska and Puget Sound.

The genus differs from *Asterias* in having numerous actinal plates (each having one or two spines) arranged in from three to six longiseries, which alternate with longiseries of large actinal papulae; inferomarginal plates lateral rather than actinal in position.[1]

There are two very distinct species, *Evasterias troschelii* Stimpson and *E. echinosoma*, herein described. *Evasterias troschelii* is one of the most variable of sea stars, which is admitting a good deal. Study of a large number of specimens indicates the existence of three fairly distinct, intergrading formae each with numerous variations.

1. Forma *troschelii*, the type form, with very unequal abactinal spines not arranged in a well-defined reticulum. This includes *Asterias victoriana* Verrill, *Leptasterias macouni* Verrill (a six-rayed young), *Evasterias troschelii*, var. *rudis* Verrill, a fully grown or giant specimen. (Pribilof Islands to Puget Sound.)

2. Forma *alveolata* Verrill, very variable, but in general with coarse spines arranged in a reticulate pattern. This form is Stimpson's interpretation of Brandt's *Asterias epichlora*, a name applied by Verrill (1914) to a small, six-rayed *Leptasterias* of the Alaskan coast. I think that Stimpson was correct and that Verrill is mistaken. Brandt's type was five-rayed, not six; the form is sometimes green above, as the name implies. This form includes *Asterias brachiata* Perrier, 1875 (preoccupied); *Evasterias troschelii*, var. *alveolata* Verrill, var. *parvispina* Verrill, and the "typical form" cited and figured by Verrill in 1914.[2] (Unalaska to Carmel Bay, Calif.)

[1] Fisher, a Preliminary Synopsis of the Asteriidae, Ann. and Mag. Nat. Hist., ser. 9, vol. 12, 1923, p. 599.

[2] Shallow-water Starfishes of the North Pacific Coast, etc. Harriman Alaska series, vol. 14, p. 153, pl. 26, figs. 1 and 2.

3. Forma *acanthostoma* (Verrill). Intergrades with *alveolata;* typical specimens differ in having uniformly small abactinal spines which stand in single file on the irregular reticulum of the skeleton and divide the abactinal area into areolae; or are more grouped and scattered so that the reticulation is not so evident; superomarginal spines in combs or groups of three to five (single, or irregularly one and two in *alveolata*). *Evasterias acanthostoma* Verrill. (Unalaska to Puget Sound.)

EVASTERIAS ECHINOSOMA, new species

Diagnosis.—Size, large; rays five, long, tapering, stout, more or less swollen, with a very convex abactinal, and a subplane actinal surface. Differing from *E. troschelii* in having uniformly large, mostly subconical, well-spaced abactinal spines; marginal plates unusually high on side of ray, the superomarginals being abactinal in position and generally monacanthid; six (or five) series of actinal plates (generally monacanthid) of which either the upper row or the inferomarginals define the margin of the ray; adambulacral plates triplacanthid, or displacanthid and triplacanthid. Type: R=330 mm., r=51 mm., R=6.4 r; br=about 60 mm.

Description.—The abactinal surface is armed with rather widely spaced and nearly uniform robust spines, cylindrical at the base, the distal half conical, longitudinally sulcated, bluntly pointed, and in giant specimens with R 300 mm., about 2.5 mm. long by 1 to 1.5 mm. thick at the base. The distal part of the spine may be slightly swollen so as to appear subcapitate. The spines of the distal portion of the ray are round tipped, and by a shortening and rounding of the terminal conical portion a subglobose, striated tip results. A majority of spines are so formed in specimens from stations 3281 (2), 3291 (1), 3235 (1), none of which have R greater than 200 mm. In the specimen from station 2842 the spines are slenderer than in the type, tapering and pointed. The spines do not have a regular arrangement. An irregular carinal series is generally fairly well marked, the dorsolaterals standing typically singly (but sometimes in groups or lines of 2, 3, or even 4) on the chief nodes of the reticular skeleton. In some of the very large specimens there are a few very delicate terete spinelets, scarcely larger than the abactinal straight pedicellariae, scattered over the abactinal surface. In the specimens on which the spinelets are more or less grouped there is rather less uniformity in size, some being of distinctly secondary size. There is a broad and pretty definite supramarginal channel bounded abactinally by a very irregular row of dorsal spines which usually but not always stand closer together than on the rest of the dorsolateral region.

The superomarginal spines are similar in form to the abactinal spines (following the variation of the latter) and are generally slightly smaller. Typically they stand one to a plate, close together, forming a very well-defined series, characteristically high on the side of the ray, so that the proximal half, at least, and sometimes the whole ray, is bordered, when viewed from above, by the inferomarginals, or by the first series of actinal spines. This character is accentuated in small examples (R 110 mm.), in which the abactinal area is narrow. Interradially the superomarginal series extends half way to the center of the disk. Two or three spines occur on the plates of the proximal half of ray in specimens from stations 4796, 3235, and 3291 (1 each).

There is a wide intermarginal channel (2 or 2.5 times length of inferomarginal spines). Inferomarginal spines similar to superomarginals, but a little longer (3 or 4 mm. in giant specimens), sometimes one to a plate, sometimes two, or rather irregularly one and two proximally and one distally. The series bends upward interradially, and in some specimens is abactinal (or dorsolateral) in position.

In large specimens there are six series of spiniferous and one short series of spineless actinal plates at the base of the ray. There is considerable variation in the number of spines to the plate. All plates may be monacanthid. In this case there are eight regular, spaced longiseries of spines, of which two are marginal series abactinal in position (station 3282). The outer three or four series are sometimes regularly or irregularly diplacanthid and the inner two or three monacanthid; or the outer row may be monacanthid, the next two irregularly diplacanthid, and the remaining three, monacanthid (station 3281). In a specimen from station 2842 a considerable number of plates are triplacanthid. In large specimens the sixth or inner series of actinal spines extends one-third R measured from center of disk. The actinal spines become gradually a little longer, sometimes heavier and clavate, in passing from the outer toward the inner series. The details of the actinal spines are variable, as in other species. The tips may be compressed and subtruncate, sulcate, or tapered, blunt, or pointed. The smallest specimen (station 3650) with R 46 mm., has four series of actinal plates. The larger specimen from Kamchatka (station 4796) with R 265 mm. has but five series of actinal plates. Whether this is constant for large Asiatic examples can not be determined.

The actinal channels are typically well marked, even broad in some cases, so that the rows of spines are distinct and separated.

The adambulacral plates are triplacanthid and diplacanthid. In large examples most of the plates of the proximal half of the ray

are triplacanthid then irregularly diplacanthid and triplacanthid, and finally on the distal third of the ray mostly diplacanthid. The distribution of these numbers will, of course, vary in different individuals. In general the proportion of plates occupied by three spines increases with the size of the animal, the third spine being added on the outer side of the plate. The combs of alternate plates are advanced further into the furrow. The first three plates following the mouth plates are generally monacanthid; then three or four are diplacanthid, following which, after a few plates of three and two, the regular triplacanthid plates commence. The spines are slender, about as long as the innter actinals. The furrow members are slightly tapered; the others, a little stouter, varying from slightly tapered to cylindrical, or somewhat clavate, round tipped to bluntly pointed. The third, outer spine may be shorter than the other two. There are usually five pairs of united plates composing the adoral carina. The large Kamchatkan example is diplacanthid, and near the end of the ray, irregularly diplacanthid and monacanthid.

Actinostome very small. Mouth plates with two apical spines in nearly vertical series, the smaller at the mouth of the furrow, the other (about as long as the plate, and sometimes spatulate) almost directly above it (as viewed from the actinal side). The suboral spine, near outer end of plate, is about as long as first two or three adambulacrals.

The papulae have the distribution characteristic of the genus and are very abundant, especially abactinally, where, in alcoholic specimens, they appear to occupy all the space between the prominent circles of crossed pedicellariae surrounding the spines. The size of the areas increases with age; about eight or nine areas can be counted across ray at base, but the dorsolaterals are very irregular. There is a fairly regular supramarginal row. The intermarginal and actinal rows—eight in all—are typically regular and decrease in size toward the furrow.

There are two sorts of straight pedicellariae, larger and smaller; the larger, usually compressed ovate, wedge shaped, with the end broadly rounded and the tip of each jaw with two or three denticles, varies from abundant to relatively few on the abactinal surface; they are generally abundant on the intermarginal and actinal integument, and a few occur on the inferomarginal, actinal, adambulacral, and oral spines. They vary to lanceolate obtuse and lanceolate acute. In large specimens the abactinal measure about 0.9 to 1 mm., while the actinal interradial ones are 1.5 mm. long. Much smaller ones are present in variable numbers on the actinal, adambulacral, and oral spines, and are rather sparsely scattered along the furrow face of the adambulacral plates.

Small crossed pedicellariae are very abundant singly and in groups among the papulae; in a broad zone around the abactinal and marginal spines; and in half wreaths on the outer side of the actinal and adambulacral spines. The abactinal measure 0.27 to 0.3 mm., while the adambulacral measure 0.35 to 0.4 mm. (large specimens with R 270 mm. or more). Apparently there is a gradual increase in the number of crossed pedicellariae, especially the papular, with age.

Madreporic body large, subplane with a row of spinelets on the adcentral border; it is situated a little less than one-third r from center of disk.

Type.—Cat. No. E1237, U.S.N.M.

Type locality.—Station 3278, north of the end of Alaska Peninsula (56° 12′ 30″ N., 162° 13′ W.), 47 fathoms, fine gray sand; bottom temperature, 38.8° F.

Distribution.—Southern Bering Sea, from Bristol Bay to Unalaska; the coast of Asia from Avatka Bay, Kamchatka, to the Okhotsk Sea; 11 to 48 fathoms, fine sand, mud, pebbles, stones; temperature range, 38° to 41.2° F.

Specimens of Evasterias echinosoma examined

Station	Locality	Depth	Nature of bottom	Bottom temperature	Number of specimens
2842	Off north coast Unalaska	41	Pebbles	41	1
3235	Bristol Bay, Alaska	11	Black stones		1
3241	do	14	Black mud	38	1
3278	North of end of Alaska Peninsula, 56° 12′ 30″ N., 162° 13′ W.	47	Fine gray sand	38.8	2
3281	do	36	Gray sand		2
3282	do	53	Fine sand, green mud	38.2	1
3285	do	35	Gray sand	41	1
3291	Mouth of Bristol Bay, near Alaskan Peninsula, 58° 58′ 30″ N., 159° 11′ W.	26	Black sand	41.2	2
3650	Okhotsk Sea (to westward of Robben Island).	28	Brown mud, sand		1
4796	Avatka Bay, Kamchatka, 52° 47′ N., 158° 43′ E.	48	Sand, pebbles		1

EXPLANATION OF PLATES

PLATE I

Evasterias echinosoma, type, abactinal surface.

PLATE II

Evasterias echinosoma, type, actinal surface.

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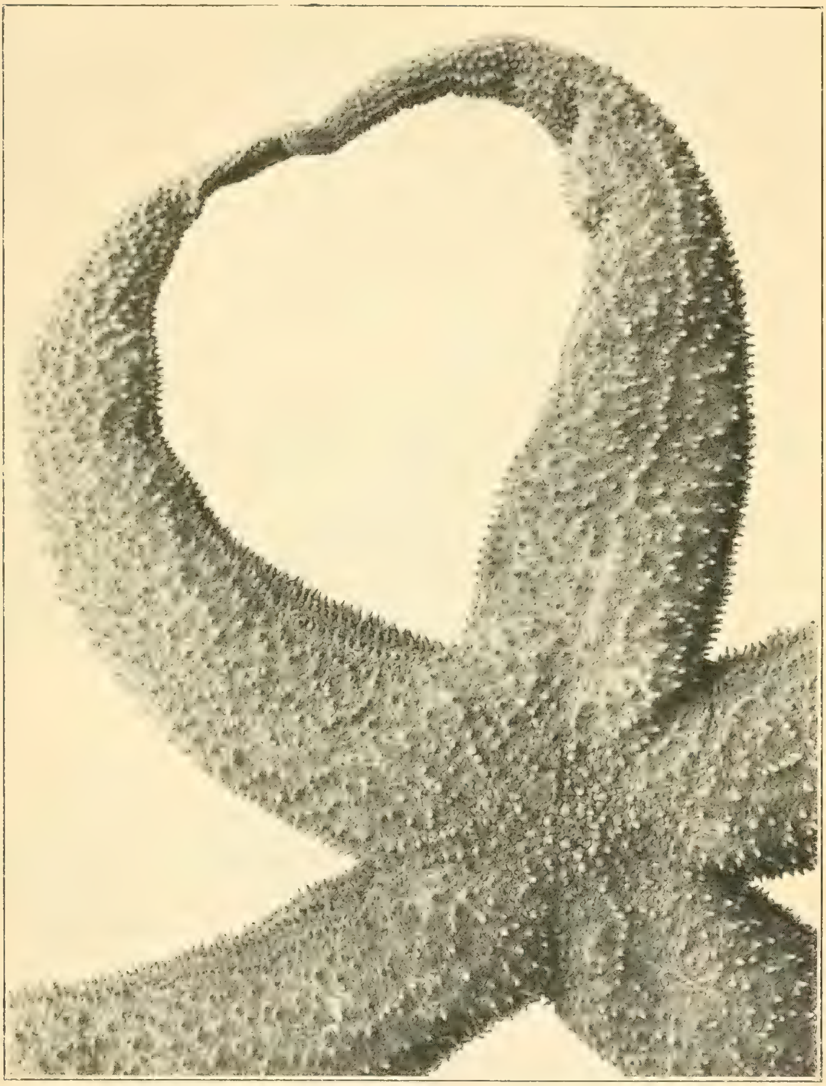
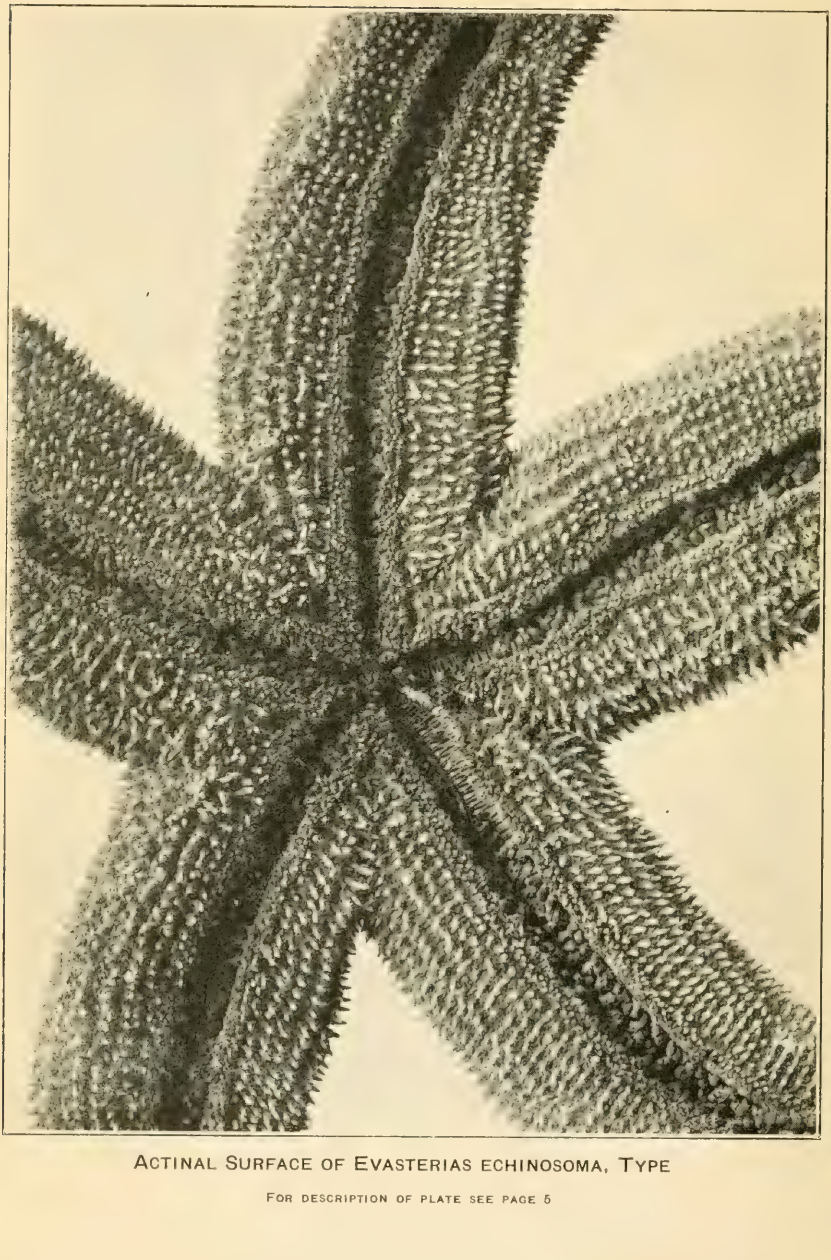


ABACTINAL SURFACE OF EVASTERIAS ECHINOSOMA, TYPE

FOR DESCRIPTION OF PLATE SEE PAGE 5



ACTINAL SURFACE OF EVASTERIAS ECHINOSOMA, TYPE

FOR DESCRIPTION OF PLATE SEE PAGE 5

DESCRIPTIONS OF NEW REARED PARASITIC HYMENOPTERA AND SOME NOTES OF SYNONYMY

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In addition to the descriptions of 14 new species of Hymenoptera belonging to the family Braconidae, this paper contains synonymical notes involving certain of Provancher's species of the braconid subfamily Microgasterinae. All of the new species are described from reared material, and all but three from specimens reared at the gipsy moth laboratory of the Bureau of Entomology at Melrose Highlands, Mass. The notes on synonymy are the result of a recent examination of the types of Provancher's species of Microgasterinae, which are in the Museum of Public Instruction, in the Parliament Building, at Quebec, Canada.

Superfamily ICHNEUMONOIDEA

Family BRACONIDAE

Subfamily Vipiinae

MICROBRACON HELIANTHI, new species

Most similar to *pini* Muesebeck, but at once separated by the blackish wings, the mostly red thorax, the entirely red abdomen, the absence of a distinct stub of a median longitudinal carina toward apex of propodeum, and the slightly longer ovipositor sheaths.

Female.—Length, 3 mm. Head long antero-posteriorly, polished; frons completely smooth and shining; diameter of opening between clypeus and mandibles about twice as long as the malar space; antennae 34-segmented, all the flagellar segments longer than broad, but not even the first twice as long as broad; thorax robust; mesoscutum smooth and polished, the lobes not at all prominent, the parapsidal grooves not distinctly impressed; furrow in front of scutellum fine, straight, finely foveolate; scutellum large, polished; propodeum entirely smooth and polished, without a distinct stub of a median

carina posteriorly; mesopleura smooth and polished; anterior wing with the second abscissa of radius more than twice as long as the first and almost as long as the third, which goes nearly to extreme apex of wing; second segment of posterior tarsi longer than the fourth; abdomen rather broad, mostly polished; first and second tergites weakly roughened; ovipositor sheaths just about as long as the abdomen. Ferruginous; head, including face, black with narrow rufous inner orbital lines; thorax ferruginous except the propectus and mesopectus, which are black; wings blackish; fore and middle legs entirely, and the posterior legs, except their femora on the basal half or two-thirds and the basal half of their tibiae, which parts are yellowish, black; abdomen entirely ferruginous.

Male.—Exactly as in the female except that antennæ are 35-segmented and the posterior femora are black only at apex.

Type.—Cat. No. 28071, U.S.N.M.

Type-locality.—San Angelo, Tex.

Allotype-locality.—Liberty, Tex.

Host.—*Isophrictis*, species.

Described from 1 female and 1 male reared by L. J. Bottimer, from larvae of the above host, the type being obtained May 27, 1924, from a larva in the flower of *Helianthus* and the allotype May 13, 1924, from a larva in the flower-head of *Rudbeckia hirta.*

Subfamily METEORINAE

METEORUS TETRALOPHAE, new species

Very similar in general appearance and in many details to *indagator* (Riley), but differs from that species particularly in having the ventral margins of the first tergite joined from almost the extreme base of the segment to a point near its middle, and in lacking the large conspicuous dorsal fossae on the petiole.

Female.—Length, 4 mm. Head transverse; temples rather flat, strongly sloping; eyes exceptionally large, converging below, hairy; malar space so short as to be practically wanting; face exceedingly narrow, apparently even slightly narrower than in *indagator*, the distance from the antennal foramina to clypeus being about one and one-half times as long as the width of face at base of clypeus; face and clypeus weakly rugulose; ocell-ocular line slightly greater than the diameter of an ocellus; antennae of type broken, but a female paratype has the antennae 30-segmented; mesoscutum mostly smooth and shining, but with a largely strongly rugulose area behind the middle lobe; scutellum short, broad, moderately convex; propodeum only slightly hollowed out behind, and completely strongly rugulose; propleura finely rugulose and opaque; mesopleura rugulose below and in the upper anterior angles; entire thorax cov-

ered with short, fine, whitish pubescence; radius arising considerably beyond the middle of stigma; first abscissa of radius short, but nearly as long as second, which is scarcely half as long as the first intercubitus; radius ending much before tip of wing; recurrent vein interstitial with first intercubitus or entering the first cubital cell just before first intercubitus; nervellus slightly longer than lower abscissa of basella; posterior coxae finely roughened and subopaque; first abdominal tergite with the ventral margins of the petiole closely joined from very near the base to about the end of the petiole itself; postpetiole above finely striate or ruguloso-striate; only a slight suggestion of dorsal fossae on the petiole; second and following segments smooth and polished; ovipositor sheaths projecting about three-fourths the length of the abdomen; exserted ovipositor as long as the abdomen. Ferruginous to testaceous; antennae brownish, scape pale beneath; thoracic sutures and the propodeum blackish; wings hyaline; stigma with a large brown cloud behind, pale along the wing margin; legs, including coxae, yellow, the hind femora at apex, the hind tibiae narrowly near base and at apex, and the hind tarsi, slightly dusky; first abdominal tergite entirely black; third and following tergites usually more or less brownish.

Type.—Cat. No. 37975, U.S.N.M.

Type-locality.—Lynbrook, Long Island, N. Y.

Host.—*Tetralopha robustella* Zeller.

Described from three females (type and two paratypes) reared by C. H. Zimmer.

METEORUS CINGILIAE, new species

Falls between *hyphantriae* Riley and *datanae* Muesebeck, being most similar to the latter, sometimes separable only with difficulty. It appears, however, to be a good species. It can usually be distinguished from *datanae* by the somewhat coarser reticulation of the propodeum, the finer punctation of the narrower median lobe of mesoscutum, the more polished, impunctate scutellum, and the much paler stigma. The posterior tibiae are entirely yellow while in *datanae* there is a distinct blackish annulus near base; and the apical fifth is black.

Female.—Length, 4.5 mm. Face about as broad at base of clypeus as long, smooth except for some weak transverse striae, shining; clypeus strongly convex; malar space about as long as basal width of mandible; ocell-ocular line a little longer than greatest diameter of a lateral ocellus; frons and vertex smooth and shining; antennae slender, 35-segmented; the middle lobe of mesoscutum distinctly shallowly punctate and shining, the quadrate area behind it, and the parapsidal grooves rugulose; lateral mesonotal lobes impunctate shining; scutellum rather small, strongly elevated, entirely im-

punctate and polished; propodeum coarsely reticulately rugose; propleura only weakly sculptured, largely smooth and shining; mesopleura mostly smooth and shining, with the longitudinal impression narrowly weakly rugulose, distinctly less strongly and less extensively so than in *datanae;* fore wing with radius arising considerably beyond middle of stigma, its first abscissa much shorter than the second but usually more than half as long; recurrent vein practically interstitial with first intercubitus; posterior coxae finely granular; abdomen strongly petiolate; the petiole smooth and polished; the postpetiole finely striate; remainder of dorsum of abdomen smooth and highly polished; ovipositor sheaths a little more than half the length of the abdomen. Ferrugino-testaceous; antennae brownish yellow; propodeum sometimes a little infuscated basally; wings hyaline; stigma pale yellow; all legs entirely yellow, the posterior tibiae not at all marked with black; postpetiole sometimes more or less blackish, but usually yellow like remainder of abdomen.

Male.—Like the female, except that there are often pronounced fuscous markings on the mesonotal lobes, and the propodeum and postpetiole are usually darker; sometimes apex of abdomen is more or less brownish.

Type.—Cat. No. 28053, U.S.N.M.

Type-locality.—Sherborn, Mass.

Host.—*Cingilia catenaria* Drury. The *Meteorus* is a solitary parasite of the larva of this geometrid, only one developing upon a host.

Described from 6 females and 6 males reared in August, 1923, from the above-named host, by J. V. Schaffner, jr., under Gipsy Moth Laboratory No. 12418 J 3–*a*. Several other series of specimens, not included in the type material, have been reared from the same host, from Westerly, R. I., and Sherborn, Brewster, and Sudbury, Mass., under Gipsy Moth Laboratories Nos. 12418 E 1, 12418 G 1, 12418 H 1–*a*, 12418 H 3, 12418 J 2, 12418 J 3 and 12418 K 1.

Subfamily MICROGASTERINAE

APANTELES FEMUR-NIGRUM (Provancher)

Microgaster femur-nigrum PROVANCHER, Addit. faun. Canad. Hymen., 1886, pp. 139, 142.

Apanteles femur-nigrum PROVANCHER, Addit. faun. Canad. Hymen., 1888, p. 388.

Apanteles trachynotus VIERECK, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 616.

Apanteles trachynotus MUESEBECK, Proc. U. S. Nat. Mus., vol. 58, 1920, p. 518.

Apanteles femur-nigrum MUESEBECK, Proc. U. S. Nat. Mus., vol. 58, 1920, p. 522.

A study of the types shows conclusively that *trachynotus* and *femur-nigrum* are identical. The species is known only from the male sex, but appears to be common throughout northeastern United States and southeastern Canada. The female may have been described under another name, but if so, it must differ considerably from the male.

APANTELES CARPATUS (Say)

Microgaster carpata Say, Boston Journ. Nat. Hist., vol. 1, 1836, p. 263.
Microgaster clavatus Provancher, Natural. Canad., vol. 12, 1881, p. 196.
Apanteles clavatus Provancher, Addit. faun. Canad. Hymen., 1888, p. 388.
Apanteles carpatus Muesebeck, Proc. U. S. Nat. Mus., vol. 58, 1920, p. 515.
Apanteles clavatus Muesebeck, Proc. U. S. Nat. Mus., vol. 58, 1920, p. 517.

The type of *clavatus* is in poor condition, but, in my opinion, is *carpatus* (Say). The name *clavatus* then must fall as a synonym of *carpatus*, rather than replace *polychrosidis* as I previously (1920) suggested.

APANTELES LATERALIS (Provancher)

Microgaster lateralis Provancher, Addit. faun. Canad. Hymen., 1886, p. 141.
Apanteles consimilis Viereck, Proc. U. S. Nat Mus., vol. 40, 1911, p. 177.
Apanteles consimilis Muesebeck, Proc. U. S. Nat. Mus., vol. 58, 1920, p. 523.
Microgaster lateralis Muesebeck, Proc. U. S. Nat. Mus., vol. 61, 1922, p. 42.

Although the abdomen and antennae of the type of *lateralis* are missing, the unusual nature of the sculpturing on the propodeum and the minute characteristics of the venation of the anterior wing in the vicinity of the second cubital cell are strikingly in agreement with those characters in *consimilis;* furthermore, Provancher's description of the abdomen agrees with abdomen of *consimilis.* I am convinced that the latter name must fall as a synonym of *lateralis.*

APANTELES LONGICORNIS (Provancher)

Microgaster longicornis Provancher, Addit. faun. Canad. Hymen., 1886, pp. 139, 143.
Apanteles longicornis Provancher, Addit. faun. Canad. Hymen., 1888, p. 388.
Apanteles radiatus Ashmead, Proc. Ent. Soc. Wash., vol. 4, 1897, p. 162.
Apanteles longicornis Muesebeck, Proc. U. S. Nat. Mus., vol. 58, 1920, p. 528.
Apanteles radiatus Muesebeck, Proc. U. S. Nat. Mus., vol. 58, 1920, p. 528.

After an examination of the type of *longicornis* I believe it to be conspecific with *radiatus;* accordingly, the latter name is here suppressed.

APANTELES NEPHOPTERICIS (Packard)

Microgaster nephoptericis Packard, Proc. Essex Inst., vol. 4, 1864, p. 122.
Apanteles ephestiae Baker, Ent. News, vol. 6, 1895, p. 201.
Apanteles ephestiae Muesebeck, Proc. U. S. Nat. Mus., vol. 58, 1920, p. 516.
Apanteles nephoptericis Muesebeck, Proc. U. S. Nat. Mus., vol. 58, 1920 p. 570.

Apparently all that remains of Packard's type series of two specimens is a fore wing mounted on a tag in the Museum of Comparative Zoology, at Cambridge, Mass. Recently, however, Dr. T. H. Frison, of the University of Illinois, sent me some specimens of an Apanteles which he had reared at Champaign, Ill., from *Vitula edmansii*, the same host from which Packard's cotypes were obtained. He suggested that his specimens might be Packard's *nephoptericis*, and a comparison with the characteristic type wing and with the original description leaves no doubt that this is the case. The identity of this species is thus established. Furthermore, Doctor Frison's material, in my opinion, is identical with the cotypes of *Apanteles ephestiae* Baker, making it necessary to suppress that name. The hosts of the types of both *nephoptericis* and *ephestiae* were found feeding on honeycomb; consequently it is not surprising that the should belong to the same species.

APANTELES PTEROPHORI, new species

A very distinct species, although somewhat resembling *fumiferanae* Viereck. From the latter it differs strikingly in the absence of the propodeal areola, in the much smoother second abdominal tergite and the much shorter ovipsitor.

Female.—Length 2.7 mm. Head strongly transverse; face a little broader at base of clypeus than long and finely punctate; frons mostly polished; vertex, temples, and cheeks finely punctate and opaque; postocellar line slightly longer than ocell-ocular line; antennae a little shorter than the body, the three penultimate segments subquadrate, only a little longer than broad; mesoscutum rather flat above, and very evenly finely punctate, subopaque; scutellum flat, very weakly sparsely punctate, shining; propodeum finely rugulose, except along basal margin, without a median areola, and also without a median longitudinal carina; mesopleura punctate and opaque anteriorly, polished posteriorly; stigma large, about as long as metacarpus and more than twice as long as broad; radius arising from middle of stigma and only very slightly longer than intercubitus; posterior coxae scarcely extending to the middle of the abdomen, mostly smooth and shining; spurs of hind tibiae of equal length and less than half as long as the metatarsus; abdomen rather broad, depressed, nearly as long as the thorax; chitinized plate of first tergite large, broadening slightly from base of apex, finely closely rugulose except medially at base; plate of second tergite short, transverse, more than three times as broad as long and slightly longer medially than at the sides, defined laterally by longitudinal grooves which are scarcely oblique; this tergite is only indistinctly sculptured, being largely smooth and polished; third tergite at least three times as long as broad, and with the following tergites, polished;

ovipositor sheaths protruding a little less than half the length of the abdomen. Black; antennae entirely black, also the tegulae and wind-bases; wings hyaline, stigma, and veins dark brown; all coxae wholly black; remainder of legs yellow; the posterior femora weakly at exterme apex, the apex of posterior tibiae and the posterior tarsi dusky; abdomen entirely black, above and below.

Male.—Essentially as in the female; however, the wings are whitish-hyaline; the first tergite does not broaden apically; the antennae are longer; and the legs are considerably darker, all coxae and trochanters, the bases of the anterior and middle femora, the hind femora mostly, the greater part of the middle and posterior tibiae, and the posterior tarsi, being black.

Cocoons.—Solitary, white, with very little loose silk.

Type.—Cat. No. 28045, U.S.N.M.

Type-locality.—Melrose Highlands, Mass.

Host.—*Pterophorus homodactylus* Walker.

Described from 3 females and 1 male reared in June, 1923, from the above host, by J. V. Schaffner, jr., under Gipsy Moth Laboratory No. 12436 J 1. The type, allotype, and one paratype are in the United States National Museum. The remaining paratype is at the gipsy moth laboratory.

APANTELES NOCTUIDIPHAGUS, new species

Quite similar to *parastichtidis* Muesebeck, but a decidedly more robust species; the abdomen is broader and much less strongly compressed; and the scutellum is more distinctly punctate.

Female.—Length, 2.7 mm. Face much broader at base of clypeus than long, shallowly punctuate and subopaque; frons, vertex, and temples very shallowly punctate and subopaque; temples bulging slightly; postocellar line apparently equal to ocell-ocular line; antennae short, much shorter than the body, the six apical segments scarcely as long as broad; mesoscutum rather flat above, very evenly punctate, opaque; scutellum large, somewhat convex, distinctly, closely, though shallowly punctate; propodeum finely rugulose and provided with a distinct medium longitudinal carina; mesopleura closely punctate anteriorly and below, polished above the impression; stigma broad, not distinctly more than twice as long as its greatest width; radius arising from about the middle of stigma, perpendicular to anterior margin of wing and distinctly longer than intercubitus, with which it is rather sharply angled; posterior coxae hardly half as long as the abdomen, weakly punctate, shining; spurs of posterior tibiae of equal length and not quite half as long as the metatarsus; abdomen at least as long as the thorax, more than three times as long as its greatest breadth, very gradually broadening to the third segment, and then gradually narrowing to the apex, only slightly

compressed; first abdominal tergite broadening a little posteriorly, finely closely rugulose, its lateral membranous margins exceedingly narrow, apparent only at apex; second tergite rectangular, two and one-half times as broad as long, finely closely rugulose, its posterior margin straight; third tergite not distinctly twice as broad as long, and, together with the following segments, entirely smooth and highly polished; hypopygidium not surpassing apex of last dorsal segment; ovipositor sheaths only slightly projecting. Black; scape of antenna black, the flagellum brownish beneath toward base, darker above and toward apex; all coxae black; remainder of legs entirely testaceous; tegulae deep black; wings hyaline; stigma and veins dark brown; abdomen black above and below, the venter slightly brownish laterally at base.

Male.—The antennae are longer than in the female, but hardly longer than the body; the extreme apex of posterior femora above, apex of posterior tibiae and the posterior tarsi are slightly infuscated; otherwise as in the female.

Cocoons.—White, gregarious, not embedded in a mass of silk.

Type.—Cat. No. 28047, U.S.N.M.

Type-locality.—Stonington, Conn.

Host—Undetermined noctuid larva on white oak.

Described from nine females and three males reared by J. V. Schaffner, jr., under Gipsy Moth Laboratory No. 12164 H 157. The type, allotype, and 8 paratypes are in the United States National Museum; the other two paratypes are at the gipsy moth laboratory.

APANTELES AMMALONIS, new species

Quite similar to *diacrisiae* Gahan, but at once distinguished from that species by the tegulae and all coxae being black and by the smooth third tergite. It also resembles somewhat *depressus* Viereck and *pyralidis* Muesebeck, but is more elongate, with a narrower, more parallel-sided first tergite, and with a less transverse second tergite. From *euchaetis* Ashmead, which it resembles in habit, and in its cocoons, it differs especially in the distinctly shorter posterior tibial spurs, the more parallel-sided first tergite and the less polished scutellum.

Female.—Length, 2.3 mm. Head transverse, the temples not broad, but bulging slightly; face much broader than long, and, together with the clypeus, very finely closely punctate and shining; frons laterally, vertex and temples, closely minutely punctate and subopaque; antennae nearly as long as the body, the apical segments shortened but distinctly longer than broad; mesoscutum thickly punctate and opaque; scutellum with shallower, more scattered punctures and shining; propodeum finely rugulose except narrowly along basal margin where it is smooth and shining, and provided

with a distinct median longitudinal carina; mesopleura punctate and opaque anteriorly, polished posteriorly; stigma rather broad; radius arising from about the middle of stigma and slightly longer than the transverse cubitus with which it makes a rather strong obtuse angle; posterior coxae smooth and shining; inner spur of posterior tibiae not distinctly longer than the outer and not quite half as long as the metatarsus; abdomen as long as the thorax, a little compressed on apical half; chitinized plate of first tergite parallel-sided, base and apex apparently of equal breadth, finely closely rugulose, more weakly so toward base; plate of second tergite trapezoidal, much wider at apex than at base and defined laterally by oblique grooved lines, entirely finely rugulose; third and following tergites smooth and polished, ovipositor sheaths very slightly exserted. Black; antennae entirely black; all coxae black; remainder of the legs yellowish except the posterior femora apically especially on the dorsal margin, the apical third of posterior tibiae and the posterior tarsi, which parts are blackish; tegulae and wing-bases black; wings hyaline, stigma and veins brown; abdomen black, with the lateral membranous margins of the first tergite and the venter at base yellowish.

Male.—Essentially like the female. As usual, the antennae are longer; and the sculptured part of the second tergite is somewhat narrower at base, leaving the lateral unsculptured margins broader.

Cocoons.—Gregarious, with only a little loose silk, and usually formed inside the host cocoon, as in the case of *Apanteles euchaetis*, the host larva being killed shortly after forming its cocoon.

Type.—Cat. No. 28044, U.S.N.M.

Type-locality.—Sommerville, N. J.

Host.—*Ammalo tenera* Huebner.

Described from 12 females and one male reared from a larva of the above host by J. V. Schaffner, jr., under Gipsy Moth Laboratory No. 12164 J 125. The cocoons were formed August 20, 1923, but the adults did not emerge until July 7, 1924. Several other small series of this species, under Gipsy Moth Laboratory Nos. 11779 H 4, 11779 H 7, and 11779 J 1, reared from larvae of the same host species, which were taken at Somerville, N. J., and Harriman, N. Y., are at the gipsy moth laboratory.

APANTELES GORDII, new species

Falls near *hydriae* Muesebeck, which it closely resembles. It can readily be distinguished from that species, however, by the much more strongly punctate mesoscutum and scutellum and by the more slender female antennae. From *smerinthi* Riley, which it also somewhat resembles, it differs in the more pronounced punctation of the mesonotum and in the black tegulae and darker posterior legs.

Female.—Length, 2 mm. Face only slightly broader at base of clypeus than long, weakly punctate, shining; frons and vertex smooth and shining; ocell-ocular line apparently equal to postocellar line; antennae very nearly, or quite, as long as the body, tapering strongly to the tip, the apical segments slender and all much longer than broad; thorax short and robust; mesoscutum with its entire surface covered with sharp, closely-set punctures, which are a little deeper and larger on the posterior part of the scutum than anteriorly; scutellum rather large, convex, distinctly punctate, shining; propodeum finely rugulose, with a more or less distinct median longitudinal carina; mesopleurae polished except anteriorly where they are closely, sharply, punctate and opaque; stigma large, not more than twice as long as broad; radius arising from middle of stigma, the outer side of the latter being fully as long as the inner; radius practically perpendicular to anterior wing margin, and a little longer than intercubitus which it joins in a rather pronounced angle; posterior coxae extending to the middle of abdomen or a little beyond, smooth and shining, with only a few small punctures on the outer face; spurs of posterior tibiae of apparently equal length and about half as long as the metatarsus; abdomen short but about as long as the thorax; chitinized plate of first tergite broadening gradually posteriorly, its apical lateral angles rather abrupt, not evenly rounded off, mostly smooth and polished, weakly punctate only on the apical third; lateral membranous margins of this tergite distinct along the apical two-thirds; second tergite transverse, more than three times as broad as long, the sculptured part narrower at base than at apex and defined laterally by curved grooved lines, setting off broad smooth lateral margins; the sculptured area of this tergite is only very weakly, almost indistinctly, roughened, shining; third and following tergites smooth and polished, the third twice as broad as long, the others much shorter; hypopygium hardly reaching apex of last dorsal segment; ovipositor sheaths subexserted. Black; antennae entirely black; tegulae deep black; all coxae wholly black, remainder of legs yellow except extreme apex of posterior femora, the apex of posterior tibiae, and the hind tarsi entirely, which are blackish; the posterior tarsi are unusually dark; sides of the venter at base yellowish.

Cocoons.—Small, dirty white, gregarious, not surrounded by a mass of loose silk.

Type.—Cat. No. 28050, U.S.N.M.

Type-locality.—Bangor, Me.

Host.—*Sphinx gordius* Stoll.

Described from four female specimens reared from a larvae of the above host by J. V. Schaffner, jr., under Gipsy Moth Laboratory No. 12184 J 2. The cocoons were formed September 14, 1923, and the adults emerged June 23, 1924.

APANTELES PYROPHILAE, new species

Most similar to *smerinthi* Riley, but differs especially in the more closely sculptured first and second tergites, in the narrower stigma, in the slightly longer posterior tibial spurs, and in the abdomen being more conspicuously compressed on its apical half.

Female.—Length 2.5 mm. Head transverse, not full behind the eyes; face broader than long, smooth and shining; frons, vertex and temples polished; vertex high; ocell-ocular line longer than postocellar line; antennae about as long as the body, slender, even the three or four apical segments being twice as long as broad; mesoscutum very weakly punctate and strongly shining; scutellum rather large, convex, with only a few indistinct punctures, shining; propodeum finely rugulose, without a distinct median longitudinal carina; mesopleura entirely smooth and polished; stigma narrow, much less than half as broad as long; radius arising distinctly beyond middle of stigma, perpendicular to anterior margin of wing, and considerably longer than intercubitus, with which it is usually joined in an even curve rather than a sharp angle; posterior coxae smooth and polished with only a few punctures on the outer edge at base; spurs of posterior tibiae subequal in length and half as long as metatarsus; abdomen nearly as long as the thorax, rather broad to the middle of the third segment, beyond which point it narrows strongly, being compressed at the apex; first tergite considerably broader at apex than at base, finely, closely rugulose, though much more weakly so on the basal half; second tergite subtrapeziodal, twice as broad as long and a little broader at apex than at base, finely closely rugulose, except down the median line where it is smooth and shining and distinctly elevated; third tergite also somewhat elevated along the median line, smooth and polished except for a little weak sculpturing in the basal lateral angles; remainder of dorsum of abdomen smooth and polished; hypopygium not surpassing apex of the last dorsal segment; ovipositor sheaths only slightly exserted. Black; scape below and the mouth parts more or less yellowish-brown; legs yellow, the fore and middle coxae at base and the posterior coxae except at extreme apex beneath, black; posterior tarsi very slightly infuscated; tegulae testaceous; wing bases blackish; wings hyaline, stigma and veins pale brown; abdomen black, more or less brownish yellow at base beneath.

Male.—Like the female except for the longer and somewhat paler antennae.

Cocoons.—Gregarious, embedded in a mass of white silk.

Type.—Cat. No. 28043, U.S.N.M.

Type-locality.—Westerly, R. I.

Host.—*Pyrophila pyramidoides* Guenée.

Described from 20 female and 2 male specimens reared from a single larva of the above host, July 3, 1917, by R. T. Webber, under Gipsy Moth Laboratory No. 12155 C 3. Five of the paratypes are at the gipsy moth laboratory, Melrose Highlands, Mass. The type, allotype, and remaining paratypes are in the United States National Museum.

APANTELES TELEAE, new species

Runs direct to *smerinthi* in my key, but can be at once separated from that species by the longer, more slender abdomen and by the first and second segments combined being decidedly shorter than the remainder of the abdomen, also by the distinctly smoother, more shining propodeum.

Female.—Length, 2 mm. Face broader at base of clypeus than long, faintly punctuate, shining; frons, vertex and temples smooth and shining; temples bulging very slightly behind the eyes; ocell-ocular line distinctly a little longer than postocellar line; antennae about as long as the body; mesoscutum finely punctate, shining; scutellum very faintly, indistinctly punctate and strongly shining; propodeum mostly smooth and polished with only a few irregular transverse rugae near the middle; stigma not more than twice as long as broad; radius arising exactly from middle of stigma, and slightly longer than intercubitus; posterior coxae not extending beyond the middle of the abdomen, smooth and shining; spurs of posterior tibiae subequal in length and not more than half as long as the metatarsus; abdomen slightly longer than the thorax, slender; chitinized plate of first tergite broadening slightly behind, mostly smooth and shining, with only a few punctures apically; sculptured area of second tergite transverse, more than twice as broad as long, defined laterally by curved grooves, distinctly broader at apex than at base, and mostly smooth and shining, with only a little faint sculpturing; third tergite hardly twice as broad as long and like the following tergites, smooth and polished; first and second abdominal segments combined not half the length of the abdomen; hypopygium not quite attaining apex of last dorsal abdominal segment; ovipositor sheaths extending slightly beyond apex of abdomen. Black; antennae wholly black; tegulae yellow; wings hyaline; stigma and veins pale brown; coxae black or blackish, the fore and middle pairs a little yellowish below; remainder of legs entirely yellow, with the posterior tarsi only very faintly dusky; abdomen brownish beneath toward base.

Type.—Cat. No. 28051, U.S.N.M.

Type-locality.—Waterford, Pa.

Host.—*Telea polyphemus* Cramer.

Described from two female specimens reared by A. B. Champlain from a larva of the above host; 22 cocoons were obtained in September, but only two of these produced adults the following spring.

APANTELES COXALIS, new species

Falls near *euphydryidis* Muesebeck, but differs particularly in the smoother face, the much more strongly sculptured and darker posterior coxae, and the less strongly compressed abdomen. From *acronyctae* Riley, which is a parasite of the same host, it differs in having yellow tegulae, in the distinctly curved posterior margin of second abdominal tergite, in the smaller, less polished scutellum and the more strongly sculptured posterior coxae.

Female.—Length, 2.2 mm. Face much broader at base of clypeus than long, faintly punctate, shining; frons and vertex smooth and shining; temples and cheeks practically impunctate, smooth and shining; antennae fully as long as the body, slender, the four apical segments considerably shorter than the preceding, but slender and much longer than broad; postocellar line slightly shorter than ocellocular line; median ocellus removed from lateral ocelli by the length of its own diameter; mesoscutum closely, coarsely punctate, much more shining laterally than in the middle; scutellum small, strongly convex, distinctly sparsely punctate, strongly shining; propodeum coarsely rugoso-reticulate, with a more or less distinct median longitudinal carina; mesopleura closely punctate anteriorly, polished posteriorly; stigma more than twice as long as its greatest breadth, radius arising beyond middle of stigma, slightly directed outwardly and not longer than intercubitus, sometimes distinctly shorter, posterior coxae punctate and subopaque, not distinctly half as long as the abdomen; spurs of posterior tibiae of equal length and not quite half as long as the metatarsus; abdomen slightly longer than the thorax, somewhat compressed toward apex; chitinized plate of first tergite broadening gradually from base to apex, finely, very closely rugulose; lateral membranous margins along this plate slender; second tergite rectangular, about as broad at apex as at base, entirely closely rugulose and opaque, the posterior margin distinctly curving forward laterally; third tergite twice as long as broad, and with the following tergites, smooth and polished; hypopygium large, extending a little beyond the last dorsal abdominal segment; ovipositor sheaths only slightly exserted. Black; antennae black, except the scape, which is yellow beneath; wings hyaline, stigma and veins brown; legs bright testaceous except the basal half of posterior coxae, which are black, and the posterior tarsi, which are more or less dusky; venter of abdomen testaceous, except on the apical third.

Male.—Like the female in practically all respects. The antennal scape, however, is darker.

Type.—Cat. No. 28048, U.S.N.M.

Type-locality.—Manchester, Conn.

Host.—*Acronycta oblinita* Smith and Abbot.

Described from 24 females and 4 males reared July 7, 1923, from a single larva of the above host, by J. V. Schaffner, jr., under Gipsy Moth Laboratory No. 12449 J 2. The type, allotype, and 18 paratypes are in the United States National Museum; the remaining 8 paratypes are at the gipsy moth laboratory.

APANTELES HADENAE, new species

Nearest *smerinthi* Riley, but differing in the broader, first abdominal tergite and in having the first and second tergites, as well as the base of the third, finely rugulose.

Female.—Length 2.2 mm. Face much broader at base of clypeus than long, weakly punctate, shining; frons and vertex smooth and polished; postocellar line and ocell-ocular line subequal; antennae nearly as long as the body, the segments becoming gradually shorter apically, but even the last three or four segments much longer than broad; mesocutum very finely shallowly punctate, faintly so posteriorly, strongly shining; scutellum rather large, convex; indistinctly punctate, polished; propodeum finely rugulose with the median longitudinal carina usually wanting or indistinct; mesopleura practically entirely smooth and polished with only a very few scattered punctures anteriorly; stigma more than twice as long as broad; radius arising from middle of stigma, perpendicular to anterior margin of wing and much longer than intercubitus; posterior coxae smooth and polished; spurs of posterior tibiae of equal length and not distinctly half as long as the metatarsus; abdomen about as long as thorax; first tergite broadening gradually toward apex, punctate, shining; second tergite transverse, more than twice as broad as long, finely punctato-granular, with rather broad unsculptured lateral margins; suturiform articulation fine, straight; third tergite impressed along its anterior margin, where it is usually feebly sculptured; remainder of dorsum of abdomen smooth and polished; hypopygium not surpassing apex of last dorsal segment; ovipositor sheaths subexserted. Black; antennae black; tegulae yellow; wing-bases brown; all coxae black; remainder of legs, including even posterior tarsi, entirely yellow, without a suggestion of duskiness; abdomen brownish beneath toward base.

Male.—Agrees with the female in all essential characters. The antennae are longer and more slender, and the second abdominal tergite is usually relatively narrower at base.

Cocoons.—White, gregarious, but not surrounded by a mass of loose silk.

Type.—Cat. No. 28049, U.S.N.M.

Type-locality.—Cranbury, N. J.

Host.—*Hadena turbulenta* Huebner.

Described from 12 females and 8 males reared by R. T. Webber under Gypsy Moth Laboratory No. 11788 H 1. The type, allotype, and 12 paratypes are in the United States National Museum; the remaining paratypes are at the gipsy moth laboratory.

APANTELES CERURAE, new species

Runs to couplet 162 in my key [1] and in most similar to *congregatus*, from which it is at once distinguished, however, by the shorter and more robust abdomen, the shorter and broader second abdominal tergite, the more delicate sculpturing of the basal abdominal tergites, and by the much narrower membranous margins on the first tergite.

Female.—Length 2.2 mm. Face but very little broader at base of clypeus than long, weakly punctate, shining; frons and vertex smooth, polished; postocellar line at least as long as ocell-ocular line; antennae as long as the body, the segments becoming gradually shorter apically, but even the last three or four segments being much longer than broad; thorax robust; mesoscutum rather uniformly covered with distinct close punctures; scutellum large, evenly convex, very faintly punctate and polished; propodeum finely rugulose, with the median longitudinal carina usually wanting or indistinct; mesopleura polished, with only a few punctures anteriorly; stigma more than twice as long as its greatest width; radius arising beyond middle of stigma, much longer than intercubitus and distinctly tending outwardly; posterior coxae large, considerably more than half as long as the abdomen, polished; inner spur of middle tibiae distinctly longer than metatarsus of middle legs; inner spur of posterior tibiae decidedly more than half the length of posterior metatarsus; abdomen shorter than thorax, broad; chitinized plate of first tergite broadening strongly behind, the lateral membranous margins being so narrow that they are apparent only at extreme apex of the tergite; basal half of this plate smooth and polished, the apical half weakly punctate; second tergite transverse, nearly three times as broad as long, with a suggestion of oblique grooves laterally, weakly irregularly punctate and strongly shining, polished medially, and its posterior margin slightly curved; third tergite much more than twice as long as broad, and together with the following tergites, smooth and polished; hypopygium scarcely attaining apex of last dorsal segment; ovipositor sheaths barely exserted. Black; antennae entirely black; tegulae yellow; wings hyaline, stigma and veins pale brown; coxae black, the fore and middle pairs more or less yellowish beneath; remainder of legs yellow, except extreme apex of hind femora above and the posterior tarsi, which are slightly infuscated; abdomen black, a little yellowish beneath at base.

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[1] Proc. U. S. Nat. Mus., vol. 58, 1920, pp. 487–502.

Male.—Like the female except for the usual sexual differences.

Cocoons.—Pale yellow, gregarious, but not embedded in loose silk.

Type.—Cat. No. 28046, U.S.N.M.

Type-locality.—Manchester, Conn.

Host.—*Cerura*, species.

Described from eight females and three males reared from a larva of an undetermined species of *Cerura*, by J. V. Schaffner, jr., under Gipsy Moth Laboratory No. 12164 J 98. The adults emerged August 21, 1923. At the gipsy moth laboratory there is another series of specimens of this species, under Gipsy Moth Laboratory No. 11707 K 25, likewise reared from an unidentified species of *Cerura*, which was taken in Somerville, N. J., by M. T. Smulyan.

APANTELES LYCIAE, new species

Exceedingly similar to *cerurae*, described above, but differs in having the first and second abdominal tergites more strongly sculptured, and in the more distinctly punctate scutellum. Reared material of the two species can be even more readily separated by the cocoons.

Female.—Length, 2.3 mm. Face scarcely broader at base of clypeus than long, distinctly finely punctate; frons and vertex smooth and polished; postocellar line about equal to ocell-ocular line; antennae about as long as the body, the flagellar segments gradually decreasing in length toward the apex; mesoscutum evenly closely punctate; scutellum moderately large, convex, distinctly punctate; propodeum rugulose, usually with a faint, more or less complete, median longitudinal carina; mesopleura finely punctate anteriorly, polished posteriorly; stigma more than twice as long as broad; radius arising a little beyond middle of stigma and not so distinctly tending outwardly before joining intercubitus, as in *cerurae*, and only slightly longer than intercubitus; nervulus distinctly shorter than first abscissa of discoideus; posterior coxae large, more than half as long as the abdomen, smooth and shining; inner spur of middle tibiae exceptionally long, being considerably longer than metatarsus of middle legs; outer spur of posterior tibiae slightly more, the inner spur much more than half the length of posterior metatarsus; abdomen robust, a little shorter than thorax; first tergite large, broadening gradually from base to apex, polished at base, closely punctate apically; lateral membranous margins of this tergite not distinct except at extreme apex; second tergite transverse, nearly three times as broad as long, entirely finely ruguloso-punctate, and its posterior margin straight, so that the tergite is no longer medially than at the sides; third tergite a little more than twice as broad as long, and together with the following tergites, smooth and polished; hypopygidium not surpassing apex of last dorsal segment; ovipositor

sheaths not exserted. Black; antennae entirely black; tegulae yellow; wing-bases brown; all coxae black; remainder of legs yellow except extreme apex of posterior femora above, apex of posterior tibiae, and the posterior tarsi, which are dusky; wings hyaline, the stigma and veins brown; abdomen more or less yellowish at base beneath.

Cocoons.—Bright buff in color, gregarious but not embedded in a mass of loose silk.

Type.—Cat. No. 28054, U.S.N.M.

Type-locality.—Hampden, Me.

Host.—*Lycia cognataria* Guenée.

Described from 16 female specimens reared August 6, 1923, from larva of the above-named host, by J. V. Schaffner, jr., under Gipsy Moth Laboratory No. 12199 J 1. The type and 12 paratypes have been deposited in the United States National Museum; the 3 remaining paratypes are at the gipsy moth laboratory.

MICROGASTER ZONARIA Say

Microgaster zonaria SAY, Boston Journ. Nat. Hist., vol. 1, 1836, p. 263.
Microgaster cinctus PROVANCHER, Natural Canad., vol. 12, 1881, p. 196; Faun. Canad. Hymen., 1883, p. 529; Addit. faun. Canad. Hymen., 1886, p. 139.
Apanteles cinctus PROVANCHER, Addit. faun. Canad. Hymen., 1888, p. 388.
Apanteles cinctus MUESEBECK, Proc. U. S. Nat. Mus., vol. 58, 1920, p. 504.

The second cubital cell in this species is so small that it is easily overlooked. This accounts for Provancher's placing *cinctus* in *Apanteles*. His type is a perfectly normal female of the striking *zonaria* Say.

MICROGASTER MELLIGASTER Provancher

Microgaster melligaster PROVANCHER, Addit. faun. Canad. Hymen., 1886, p. 143.
Microgaster rubricoxus PROVANCHER, Addit. faun. Canad. Hymen., 1888, p. 386.
Microgaster rubricoxa MUESEBECK, Proc. U. S. Nat. Mus., vol. 61, 1922, p. 33.
Microgaster melligaster MUESEBECK, Proc. U. S. Nat. Mus., vol. 61, 1922, p. 33.

The type of *rubricoxa* is clearly a male of *melligaster*, which was described from a female specimen.

MICROGASTER SCOPELOSOMAE, new species

Most similar to *comptanae* Viereck, but differs especially in the much more coarsely sculptured face, the finer sculpture of the basal abdominal tergites and the shorter female antennae.

Female.—Length 2.8 mm. Face at base of clypeus nearly twice as broad as long, and together with the clypeus, coarsely confluently

punctate and opaque; malar space shorter than basal width of mandible; frons strongly punctate laterally and with fine curved striae below median oscellus; vertex and temples punctate, subopaque; ocell-ocular line subequal with postocellar line; antennæ much shorter than the body, the three or four apical segments hardly longer than broad; mesoscutum finely punctate anteriorly, polished posteriorly; scutellum impunctate, highly polished; propodeum rugose with a prominent median longitudinal carina; mesopleura shallowly punctate anteriorly, polished posteriorly; stigma a little more than twice as long as broad; radius arising from beyond middle of stigma, strongly tending outwardly, and longer than first intercubitus; posterior coxae smooth and shining on the outer face; abdomen short and stout; first tergite short and broad, broadening strongly posteriorly, distinctly broader at apex than long, finely closely rugulose over its entire surface, more weakly so in the median impression at base; second tergite rectangular, three times as broad as long, entirely finely rugulose and opaque; suturiform articulation fine, straight, not at all curving forward laterally; third tergite scarcely as long as the second, smooth and shining, with only a few faint punctures at base; remaining tergites much shorter, smooth, and polished; hypopygium large, but not surpassing apex of last dorsal segment; ovipositor sheaths about half as long as the abdomen. Black; scape black; antennal flagellum brownish beneath, black above and at apex; wings uniformly slightly dusky; all coxae entirely black; trochanters, femora, tibiae and tarsi of all legs entirely testaceous; abdomen completely black, including even venter at base.

Male.—Like the female except for sexual differences. The antennae are about as long as the body.

Cocoons.—Gregarious, encased in a ball of silk, which very closely resembles the cocoon mass of *Apanteles atalantae*, and is easily mistaken for a spider egg cocoon.

Type.—Cat. No. 28052, U.S.N.M.

Type-locality.—Melrose Highlands, Mass.

Host.—*Scopelosoma devia* Grote.

Described from 4 female and 2 male specimens reared from the above-named host by J. V. Schaffner, jr., under Gipsy Moth Laboratory. No. 12164 J 34.

○

CRUSTACEANS OF THE ORDERS EUPHAUSIACEA AND MYSIDACEA FROM THE WESTERN ATLANTIC

By Walter M. Tattersall
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INTRODUCTION

Dr. H. B. Bigelow was good enough to submit to me for examination and report the Euphausiacea and Mysidacea collected in the west Atlantic by the United States Coast Survey steamer *Bache* in January to March, 1914. The collection contained 27 species of Euphausiacea and 11 species of Mysidacea, while from the point of view of numbers it was an extremely large collection.

The itinerary of the cruise of the *Bache*, together with a full account of the oceanographical results obtained, has already been published (Bigelow, 1917*a*), but for the sake of convenience a list of the stations at which Euphausians or Mysids were taken is given on pages 4–6.

The area explored during this cruise has never before been systematically examined for the crustacea here reported on, although a large number of disjointed and scattered records are to be found in literature. Hansen (1915) has given a great many records of Euphausiacea from the west Atlantic, mainly, however, in the northwestern part of the area now under consideration. Ortmann (1893) records certain species from or near to this area, taken during the German Plankton Expedition, and Colosi (1920) adds a few records from the Caribbean Sea. The present collection, however, by linking up hitherto explored areas, adds considerably to our knowledge of the occurrence and distribution of the Euphausiacea in the west Atlantic and, incidentally, and to a lesser degree, of the Mysidacea also.

Only one new species was discovered, a Mysid, *Mysidopsis bigelowi*, from the littoral waters of Chesapeake Bay. The most interesting species taken by the expedition was the Mysidacean, *Paralophogaster glaber* Hansen, hitherto only known from the Pacific Ocean, near the Dutch East Indies, and in the waters off New Zealand. Its discovery in the western Atlantic is therefore most interesting from the point of view of geographical distribution and demonstrates the wide range of this bathypelagic species. Other notable records are those of the larvae of a large species of *Thysanopoda* and of the adults of *Nematobrachion sexspinosus* Hansen, hitherto known from three specimens only.

In attempting to summarize the results obtained by the *Bache*, from the point of view of the crustacea now dealt with, one or two points emerge which may be noted here.

1. Stations 10157–10160 are situated in a faunistic area which is quite sharply marked off from the rest of the area explored.

Station 10157 is a purely littoral station characterized by the presence of the littoral Mysids, *Mysidopsis* and *Neomysis*. Station 10160 is in the coastal waters and station 10158 on the slope where the tropical oceanic water and the coastal water mix. These two stations are characterized by the presence of three Euphausians, *Euphausia krohnii*, *Meganyctiphanes norvegica*, and *Nematoscelis megalops*, the first and last in great abundance. These three species occurred at no other station in the whole area explored and are, moreover, northern or boreal species. At station 10160 only these three species occurred, but at station 10158, which is nearer to the slope, the following additional species were found:

	Specimen
Thysanopoda monacantha	1
Euphausia tenera	4
Euphausia hemigibba	2
Thysanoëssa gregaria	66
Nematoscelis microps	1
Nematobrachion boopis	1

These species are members of the tropical oceanic fauna, and the haul at station 10158 bears out in a striking way the oceanographical results of the cruise, in which station 10158 was found to be in the region of the slope where the coastal and oceanic waters mix. The Euphausian fauna at this station shows abundant evidence of this mixing of the waters, retaining, however, a predominant northern or coastal facies.

The stations 10158 and 10160 are probably on the seaward fringe of the area of distribution of *Meganyctiphanes norvegica*, which would account for its occurrence in such small numbers. The difference in the relative abundance of *E. krohnii* and *N. megalops* at the two stations is probably correlated with the difference in the depth at which the hauls were taken. At station 10160 a haul at 100 meters yielded only 4 *N. megalops* to about 2,000 *E. krohnii*, while at station 10158, where the haul was made at 600 meters, the numbers were 500 and 2,000, respectively.

2. The rest of the area, which may be called the tropical oceanic area, represented by the hauls from stations 10161–10212, appears, at least as far as the Euphausians are concerned, to be a homogeneous uniform faunistic area. It has not been possible to say, from an examination of the hauls, that one or another species is more abundant in and characteristic of any special part of the area. All the species appear, with greater or lesser degrees of abundance, to be generally and widely distributed in this area.

I have tried to analyze the results in order to find out if they provided any information as to the vertical distribution of the Euphausians. It was obvious from the merest glance at many of the hauls that certain genera and species were characteristic of certain zones but it has not been easy to demonstrate this on paper. The explanation of this difficulty probably lies in the fact that the nets used for plankton were open nets and, therefore, in a haul from deep water, a certain number of specimens of upper water forms would be caught during the ascent of the net. It has been impossible to decide how much allowance must be made for this and to eliminate this source of error. One example will suffice to illustrate this point. *Euphausia americana* is clearly an upper water, if not a truly surface, species yet the records reveal its occurrence in small numbers in even the deepest hauls down to 1,800 meters. One other consideration has complicated the question. There is a certain amount of evidence available to suggest that some species of Euphausians at any rate exhibit diurnal movements, rising to the upper waters during hours of darkness and sinking to deeper waters by daylight. I have not been able to take this consideration into account in the following pages. At the same time I think it is possible to suggest with a certain measure of confidence the following general conclusions on the vertical distribution of the species of Euphausians found in the collection.

The species may be classified roughly into the following groups apparently characteristic of particular zones of water:

1. Species which have their maximum of abundance in the upper 100 meters of the sea and are frequently taken actually at the surface:

Euphausia americana.
Euphausia brevis.
Euphausia mutica.
Euphausia tenera.
Euphausia hemigibba.

2. Species which have their maximum of abundance between 100–200 meters and are rarely captured at the surface:

Thysanopoda tricuspidata.
Thysanopoda monacantha.
Stylocheiron carinatum.
Stylocheiron suhmii.
Thysanopoda aequalis.
Euphausia gibboides.
Nematobrachion flexipes.

3. Species which are truly deep water with the maximum of abundance at depths below 200 meters:

Bentheuphausia amblyops.
Thysanopoda microphthalma.
Nematoscelis microps.
Nematoscelis tenella.
Stylocheiron elongatum.
Stylocheiron abbreviatum.
Thysanopoda cornuta.
Thysanoëssa gregaria.
Nematobrachion boopis.
Nematobrachion sexspinosus.
Stylocheiron longicorne.
Stylocheiron maximum.

These tentative suggestions are based on the evidence provided by the present material and are not opposed to anything that was previously known of the vertical distributions of the species concerned.

Data to accompany cited Bache stations, 1914

Stations	Date	Lat. N.		Long. W.		Depth	Salinity (per mill)	Temperature
		°	′	°	′	*Meters*		°*C.*
Off Chesapeake Bay:								
10157	Jan. 20	36	46	75	38	0	30.01	6.20
						18	33.57	6.75
10158	Jan. 21	36	12	74	25	0	34.94	12.30
						20	34.67	11.45
						100	34.76	11.15
						300	35.19	11.40
						700	35.01	4.78
						1,100	35.01	4.20
						1,800	34.94	3.55
10160	Jan. 26–27	36	12	74	41	0	34.29	9.15
						20	34.29	9.40
						100	35.28	12.00
						200	35.37a	9.45
Line, Chesapeake Bay to Bermuda:								
10161	Jan. 28	35	27	73	14	0	36.38	21.50
						20	36.35	21.50
						100	36.44	21.35
						200	36.44	19.60
						600	35.99	15.20
						1,000	35.25	10.40
						1,800	----------	3.70
10162	Jan. 29	34	41	73	23	0	36.44	19.30
10163½	Jan. 30	33	02	73	38	0	36.44	19.90
10166	----------	32	33	72	14	0	36.45	19.15
10169	Jan. 31–Feb. 1	32	29	71	29	0	36.44	18.95
						20	36.38	19.00
						100	36.44	18.85
						200	36.42	18.83
						600	36.26	15.60
						1,000	----------	10.50
						1,800	35.01	----------
10171	Feb. 2	32	27	69	55	0	36.45	18.95
						20	36.44	19.03
						100	36.45	18.84
						200	36.44	18.65
						600	36.08	16.10
						1,000	35.71	6.70
						1,800	34.99	4.00
10172	Feb. 3	32	26	69	21	0	36.45	18.90
10173	Feb. 4	32	27	68	22	0	36.44	18.85
						20	36.44	18.90
						100	36.42	18.79
						200	36.44	18.10
						600	36.17	16.50
						800	35.64	13.10
						1,000	----------	11.60
						1,400	35.46	5.55
						1,800	34.96	3.90
						3,650	----------	----------
						4,570	34.87	----------
10176	Feb. 5	32	30	65	48	0	36.44	19.20
Off Bermuda:								
10178	Feb. 17–18	32	20	64	21	0	36.42	18.80
10180	Feb. 18–19	31	52	65	14	0	----------	18.10
Line, Bermuda to the Bahamas:								
10182	Feb. 19–20	30	27	66	05	0	36.56	20.12
10184	Feb. 21	29	17	67	07	0	36.56	20.07
10186	Feb. 21–22	29	15	68	35	0	36.47	19.40
10187	Feb. 23	28	59	69	22	0	36.51	19.30
						20	--------	19.23
						100	36.49	19.26
						300	36.47	----------
						600	36.24	16.44
						800	35.70	13.05
						1,000	35.19	9.05
						1,200	35.05	----------
						1,400	34.99	5.08
						1,800	34.99	4.01
10188	Feb. 24	28	51	70	08	0	36.47	19.47
10192	Feb. 26	28	35	73	33	0	36.62	21.58
						4,528	35.03	----------
						4,733	35.03	----------
10194	Feb. 28	28	51	75	13	0	36.53	21.55
10195	----------	29		76	23	0	36.49	21.70

Data to accompany cited Bache stations, 1914—Continued

Stations	Date	Lat. N.	Long. W.	Depth	Salinity (per mil)	Temperature
Northeast Providence Channel:		° ′	° ′	*Meters*		° *C.*
10196	Mar. 3	25 27	77 16	0	36.58	22.83
				20	----------	22.84
				100	36.56	22.82
				500	35.64	12.93
				1,000	35.03	5.20
				3,400	34.92	2.86
Straits of Florida:						
10198	Mar. 13	23 59	81 50	0	36.11	23.35
				20	36.11	23.06
				100	----------	20.34
				200	----------	13.98
				400	----------	10.36
				900	34.90	7.00
10200	Mar. 18	23 32	81 48	0	35.93	24.78
				20	35.93	24.72
				100	36.26	24.45
				200	36.58	22.34
				400	35.66	13.51
				600	35.03	9.10
				1,000	34.87	8.31
				1,400	----------	4.30
10202	Mar. 19	25 34	79 24	0	36.17	23.35
				20	----------	23.30
				100	36.26	23.23
				200	36.67	21.82
				300	36.44	18.71
				400	36.26	16.63
				500	35.81	14.15
				700	35.53	12.17
10203	Mar. 20	25 34	79 42	0	36.08	24.03
				20	----------	24.03
				100	36.26	23.25
				200	36.53	20.17
				300	35.99	15.95
				400	35.84	14.42
				800	34.85	6.16
20201	----------	25 33	80 03	0	36.17	21.75
				20	36.20	21.83
				100	36.17	21.07
				150	35.30	10.72
10205	----------	27 05	79 52	0	36.02	23.60
				20	36.08	22.88
				60	36.22	22.48
				100	36.04	19.19
				175	35.43	12.25
				250	34.85	6.90
10206	Mar. 21	27 17	79 40	0	36.09	23.75
				20	36.11	23.40
				100	36.26	23.40
				200	36.55	20.13
				300	38.82	14.71
				400	25.10	9.68
				500	----------	8.53
				700	34.85	5.70
10207	----------	27 32	79 21	0	36.17	23.70
				20	36.17	23.60
				100	36.20	23.30
				200	36.56	19.93
				300	36.38	17.61
				400	36.08	15.78
				500	25.79	13.90
North of Bahama Bank:						
10208	Mar. 21	27 46	78 46	0	36.42	22.80
				20	36.44	22.42
				100	36.51	----------
				200	36.53	19.91
				300	36.42	18.78
				500	36.18	16.39
				700	35.37	10.88
				800	35.03	8.26
10209	Mar. 22	27 57	78 15	0	36.44	22.23
				20	36.45	21.52
				100	36.49	20.65
				200	36.49	18.57
				400	36.11	16.11
				500	35.97	----------
				700	35.26	10.08
				800	----------	7.41
				900	35.01	5.98

Data to accompany cited Bache Stations, 1914—Continued

Stations	Date	Lat. N.	Long. W.	Depth	Salinity (per mill)	Temperature
North of Bahama Bank—Continued						
		° ′	° ′	*Meters*		°*C.*
10210		27 59	77 25	0	36.42	21.78
				20	36.40	21.80
				100	36.51	21.56
				200	36.55	20.80
				300	36.49	17.44
				450	36.31	17.06
				600	36.00	----------
				800	----------	10.29
				1,000	35.10	6.04
10211		28 08	76 48	0	36.55	20.98
				20	----------	21.02
				100	36.55	20.85
				300	36.42	17.81
				500	36.22	16.29
				700	35.73	13.38
				850	----------	8.57
				1,000	35.07	6.64
10212	Mar. 23	28 10	76 18	0	36.60	20.75
				20	36.56	20.80
				100	36.56	20.50
				300	36.26	17.77
				500	35.97	14.62
				750	35.10	10.01
				1,000	35.03	5.62
				1,800	35.01	3.67

Order MYSIDACEA

Suborder LOPHOGASTRIDA

Family LOPHOGASTRIDAE

Genus LOPHOGASTER M. Sars

1. LOPHOGASTER TYPICUS M. Sars

Lophogaster typicus Ortmann, 1906.

Occurrence.—Station 10209, 100–0 m., 1 specimen, immature, 7 mm. long.

Remarks.—Traces of the pectinations on the rostral plate, characteristic of the pelagic post-larval stages of this species, still remain on this specimen. The rostral plate forms a complete hood over the eyes as in the Calyptopis stages of the Euphausiacea. The median spine is longer than the laterals and slightly longer than the antennular peduncle. The antennal scale has five teeth, including the terminal tooth, on the outer margin. The telson has three spines on the lateral margin in addition to the two large spines on each side of the apex, and there are eight teeth on the pectinate apex of the telson. The sternal armature of the abdomen, one very prominent median forwardly directed sharp spine to each segment, is well developed. The postero-lateral free corners of the pleura of the fourth and fifth abdominal somites are acute but scarcely produced. Those of the sixth somite, as well as those marking the apparent division of this somite into two parts, are more produced than those of the fourth and fifth somites but nothing like to the same degree as in *L. spinosus*. Ortmann (1906), in describing the latter species, writes that it differs

from *L. typicus* in possessing a subdorsal spine directed straight backwards on the posterior margin of the sixth abdominal somite, at the base of the telson on each side. These spines are really present in *L. typicus* but are not nearly so well developed or so prominent as in *L. spinosus*.

Distribution.—Ortmann (1906) first made known the occurrence of this species off the coast of North America, recording it from off the coasts of North and South Carolina, the Gulf of Mexico and Key West, though Smith (1881) had earlier noted the presence of *Lophogaster* off the coasts of New England, without naming the species. These are the only records, with which I am acquainted, from this region of the Atlantic Ocean. The *Bache* specimen was captured at a point intermediate between the Carolina stations and Key West of Ortmann's records.

2. LOPHOGASTER SPINOSUS Ortmann

Lophogaster spinosus Ortmann, 1906, p. 26, pl. 1, figs. 1*a*, 1*b*.—Hansen, 1910, p. 14.—Zimmer, 1914, p. 382.

Occurrence.—Station 10195, 100–0 m., 1 young specimen, 9.5 mm. long from the tip of the rostrum to the end of the telson.

Remarks.—Although the specimen is so small, it exhibits all the characters distinctive of the species as compared with *L. typicus*. The median spine of the rostral plate is hardly as long as in the type-specimen and this fact was also noted by Zimmer in young specimens. On the other hand the postero-lateral prolongations of the carapace are proportionally longer than in the type, extending backward almost to the level of the posterior margin of the third abdominal somite. The antennal scale has nine teeth, including the terminal, on the outer margin. The telson has altogether eight pairs of lateral spines, including the large terminal pair, and has five teeth on the pectinate apical portion. The postero-lateral free corners of the third, fourth, fifth, and sixth abdominal pleura are acute and produced into prominent spines, less produced in the third pleura than in the others but in all cases much more produced than in *L. typicus*, in which the pleura of the third somite are without spines.

Distribution.—The type-specimen was taken at 30° 47′ 30″ N., 79° 49′ W., north of the Bahamas. The *Bache* specimen is from a locality rather to the northeast of the Bahamas but not very far from the type-locality. Zimmer, however, has recorded the species from the South Atlantic, midway between South America and South Africa. From the fact that the present specimen was caught in a midwater townet, it seems probable that *L. spinosus*, like *L. typicus*, is pelagic in the post-larval and young stages. In this connection it is to be noted that one of Zimmer's specimens was caught in a townet at only 10 meters. The *Bache* specimen shows no traces of pectinations on the rostral plate or abdominal pleura.

Genus PARALOPHOGASTER Hansen

3. PARALOPHOGASTER GLABER Hansen

Paralophogaster glaber Hansen, 1910, p. 16, pl. 1, figs. 2*a*–2*n*.—Tattersall, 1923, p. 279.

Occurrence

Station	Depth	Specimen	Length	Station	Depth	Specimen	Length
	M.		*Mm.*		*M.*		*Mm.*
10163½	500–0	1	12	10206	400–0	2	12
10173	200–0	1	6	10208	700–0	1	12
10195	100–0	1	9	10209	700–0	1	12

Remarks.—This is the most interesting of the species in the present collection. The type specimens were described from the *Siboga* collections made in the waters around the East Indies and I have since recorded the species from the waters off New Zealand. Its capture, therefore, by the *Bache* in the waters of the western North Atlantic must be regarded as one of the most important results of that expedition. In spite of the wide separation in the geographical position of the localities of capture, I can find no reasonable ground for separating the Atlantic specimens from the East Indian and New Zealand species. Such points of difference as I have been able to discover may be summarized as follows: (1) The rostral plate is more distinctly tridentate than shown by Hansen, with the lateral teeth more prominent and more on a level with the median tooth; (2) the antennal scale is apparently slightly shorter in my specimens than as described and figured by Hansen. It is only three and a half times as long as broad and projects beyond the distal end of the antennular peduncle for only one-third of its length. In Hansen's specimens the scale was four times as long as broad and extended beyond the antennular peduncle for one-half of its length; (3) the telson has only three short and two long spines on each margin, with only three spinules between the two large spines. In Hansen's specimens there were four short and two long spines and six or seven spinules between the long spines.

The *Bache* specimens are all immature and this fact may account for some, at any rate, of these differences, more particularly the last one. The agreement, almost to the most minute detail, however, between the appendages of the west Atlantic specimens and those described by Hansen, is so very striking and the differences noted above are so much more of degree than of actual form, that I feel compelled, for the present at any rate, to regard the East Indian and west Atlantic specimens as belonging to one widely distributed species.

Distribution.—East Indian Seas (Hansen); off New Zealand (Tattersall).

Family EUCOPIIDAE

Genus EUCOPIA Dana

4. EUCOPIA UNGUICULATA (Willemoes-Suhm)

Occurrence.—Station 10166, 1100–0 m., 1 specimen.

Remarks.—I can find no previous record of this species from the area explored by the *Bache* or indeed from the northwest Atlantic anywhere in close proximity to the coast of America.

Suborder MYSIDA

Family MYSIDAE

Subfamily SIRIELLINAE

Genus SIRIELLA Dana

5. SIRIELLA THOMPSONII (H. Milne-Edwards)

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
10161	Surface	5	10200	Surface	2
10161	100–0 m	2	10200	75–0 m	2
10163½	Surface	5	10203	Surface	2
10173	do	1	10205	do	1
10176	do	1	10206	do	2
10180	do	11	10208	do	3
10186	25–0 m	1	10208	100–0 m	1
10186	85–0 m	1	10209	Surface	1
10194	Surface	20	10209	100–0 m	2
10194	50–0 m	2	10211	Surface	2
10194	600–0 m	6	10212	300–0 m	1

Remarks.—This widely distributed surface species has been recorded previously from the area explored by the *Bache* by Ortmann (1893) and from the Caribbean Sea by Colosi (1920). It is of interest to note that 13 of the 22 gatherings in which it was taken were made at the surface and all but two in water of 100 meters or less.

Subfamily GASTROSACCINAE

Genus ANCHIALINA, Norman

6. ANCHIALINA TYPICA (Kröyer)

Anchialina typica Hansen, 1910, p. 52, pl. 7, figs. 2*a*–2*k*.

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
10161	100–0 m	2.	10195	100–0 m	3.
10178	Surface	1 male.	10203	75–0 m	1 female.
10182	1,800–0 m	1 male.	10208	Surface	1 male.
10192	100–0 m	1 male.	10208	100–0 m	1 female.

Remarks.—This species has not previously been recorded from the area explored by the *Bache*, but Hansen has noted its occurrence in the waters of the Danish West Indies and St. Thomas, immediately to the south, and Colosi has recorded it from the Caribbean Sea.

Subfamily MYSINAE

Genus KATERYTHROPS Holt and Tattersall

7. KATERYTHROPS OCEANAE Holt and Tattersall

Occurrence.—Station 10166, depth 1,100–0 m., 2 males; station 10211, depth 500–0 m., 1 immature specimen.

Remarks.—This species has not been recorded previously from the area under notice.

Genus EUCHAETOMERA G. O. Sars

8. EUCHAETOMERA TYPICA G. O. Sars

Occurrence.—Station 10173, depth 200–0 m., 3 specimens; station 10187, depth 200–0 m., 1 female.

Remarks.—This widely distributed species has not actually been recorded before from the *Bache* area, but is known from the more southerly and tropical parts of the Atlantic.

9. EUCHAETOMERA TENUIS G. O. Sars

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
10173	200–0 m	1 female.	10209	700–0 m	1 female.
10200	500–0 m	1 female.	10211	500–0 m	2 females.

Remarks.—Previously known from this area from the collections made by the Plankton Expedition (Ortmann).

Genus MYSIDOPSIS, G. O. Sars

10. MYSIDOPSIS BIGELOWI, new species

Holotype.—Cat. No. 59115, U.S.N.M.

Occurrence.—Station 10157, surface, few immature males and females.

Description.—*Carapace* produced between the eyes into a short low triangular rostral plate with a bluntly pointed apex; anterolateral corners rounded.

Eyes of moderate size, cornea occupying less than half of the whole eye in dorsal view; no fingerlike process on the outer dorsal portion of the eyestalk.

Antennal scale five times as long as broad, narrowly lanceolate in shape, setose all round, without a distal joint, apex bluntly rounded, extending beyond the peduncle of the antennules by about one-quarter to one-third of its length, a prominent spine on the outer distal corner of the joint from which the scale springs; the distal joint of the antennal peduncle only slightly more than half as long as the preceding joint, the whole peduncle extending to about two-thirds of the antennal scale.

Maxillulae with a definite shoulder on the outer margin of the outer plate proximal to which are a few minute spinules; inner plate with two setae.

Maxillae with the proximal lobe narrow; distal lobe divided into two parts by a short furrow; palp long, distal joint narrowly oval, nearly twice as long as broad and twice as long as the proximal joint; exopod long and narrow, setae present only on its outer margin and the distal setae much longer than the proximal.

First thoracic limbs of the normal form characteristic of the genus with the second and third joints of the endopod fused; the limbs are rather shorter and stouter than in the European species of the genus especially with regard to the sixth joint; seventh joint not longer than broad; dactylus stout and straight.

Second thoracic limbs with the endopod relatively enormously developed, much more robust than in any known species of the genus and as far as the present material goes, more robust in the female than in the male; this relative development of the limbs is attained mainly by the large size of the sixth joint which is one-quarter longer than the fifth and four times as long as broad; it is widest just distal to the middle and from this point the joint narrows considerably, the distal portion of the inner margin being slightly concave and armed with numerous spiniform setae; the outer distal margins are also armed with numerous setae; the seventh joint is about one-fourth of the length of the sixth and terminates in a strong somewhat curved nail; the outer margin is convex and the inner margin concave and fringed also with spiniform setae; the inner face of this joint is armed with numerous very strong setae which are barbed on one side only; the concave inner margin of the seventh joint folds down against the distal portion of the inner margin of the sixth joint to form a kind of subchela to the limb; in the male specimens, which are, however, immature, the second thoracic limbs have the same general form as in the female just described but appear to be less robust and the subchelate appearance of the limbs is less well marked.

Remaining thoracic limbs with the sixth joint of the endopod divided into two subjoints by a transverse suture; seventh joint very short and terminating in a long slender nail.

Abdomen with the sixth somite one and two-thirds time as long as the fifth.

Pleopods in the only males available, which are immature, are all distinctly biramous.

Telson as long as the sixth abdominal somite, one and a third times as long as broad at the base and three times as long as the breadth at the apex, entire and broadly linguiform in shape with the apex broadly rounded; lateral margins with about twelve short stout spines distributed along the whole length; apex armed with three

pairs of long strong spines, the inner pair equal in length to one-third of the telson, the next pair slightly shorter and the outer pair only one-fifth of the telson in length; no plumose setae on the apex.

Inner uropods one and a half times as long as the telson with five spines on the inner lower margin in the region of the statocyst; outer uropods slightly longer than the inner.

Length of immature specimens of both sexes, 7 mm.

Remarks.—This species may be distinguished by the combination of characters afforded by the unjointed antennal scale, the powerfully developed endopod of the second thoracic limbs and the form of the telson and its armature. Only one other described species of the genus, *M. acuta* Hansen, possesses an unjointed antennal scale. In all the other species the scale has a small distal portion separated off by a distinct suture. In *M. acuta*, however, the terminal portion of the scale is acutely pointed and thus differs markedly from the present form in this respect. In the general form of the telson, *M. bigelowi* agrees very closely with *M. kempii* Tattersall. These two species have a form of telson and telsonic armature quite distinct from those of any of the remaining species. In *M. kempii* there are four pairs of stout spines at the apex and in *M. bigelowi* only three. *M. kempii*, however, differs from *M. bigelowi* in having a distinct distal joint to the antennal scale, in the much less robust endopod to the second thoracic limbs and in the fact that the sixth joint of the endopods of the remaining thoracic limbs is three-jointed.

Genus NEOMYSIS Czerniavsky

11. NEOMYSIS AMERICANA (S. I. Smith)

Occurrence.—Station 10157, surface, abundant.

Distribution.—This common American species has been recorded from several localities on the eastern coast of America from Massachusetts to New Jersey, but I can not trace any previous record from so far south as the present one which is from off the coast of Virginia. It is, however, doubtless abundant in the shallower waters along the greater part of the coast.

Order EUPHAUSIACEA

Family EUPHAUSIIDAE

Genus BENTHEUPHAUSIA G. O. Sars

12. BENTHEUPHAUSIA AMBLYOPS (G. O. Sars)

Occurrence.—Station 10182, 1800–0 meters, 1 specimen, 10 mm. long.

Remarks.—The single specimen is still post-larval and presents a character not hitherto known in the genus, namely, the posterior half of the lower free margin of the carapace is serrate. Serrations

on various parts of the cuticle of Euphausians are not infrequent during the larval and post-larval stages. They are most frequently found on the anterior margin of the carapace and on the rostral plate. In some larvae which I attributed to *Euphausia longirostris* Hansen, however, serrations on the lower free margins of the carapace were present (Tattersall, 1924). The serrations on the present specimen of *Bentheuphausia amblyops* are, I take it, the last remains of a similar armature.

Distribution.—Hansen (1915) recorded two specimens of this species from localities in the West Atlantic off the coasts of America, about 7–10° north of the place at which the *Bache* specimen was captured. These records are the only ones with which I am acquainted from the immediate vicinity of the area explored by the *Bache.*

Genus THYSANOPODA H. Milne-Edwards

13. THYSANOPODA TRICUSPIDATA H. Milne-Edwards

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
10162	150–0 m	5	10192	100–0 m	2
10166	100–0 m	3	10194	50–0 m	5
10169	50–0 m	2	10200	75–0 m	30
10171	75–0 m	2	10200	500–0 m	2
10173	Surface	1	10203	75–0 m	2
10182	1800–0 m	1	10203	150–0 m	1
10184	50–0 m	1	10206	400–0 m	2
10186	25–0 m	1	10209	100–0 m	10
10186	75–0 m	1	10209	700–0 m	1
10188	75–0 m	1	10211	500–0 m	1

Analysis of above records

Depth of net	Total number of hauls	Number of hauls in which species occurred	Total number of specimens	Depth of net	Total number of hauls	Number of hauls in which species occurred	Total number of specimens
Meters				*Meters*			
0	18	1	1	400	3	1	20
25	2	1	1	500	4	2	3
50	5	3	8	600	1	0	0
75	8	5	36	700	2	1	1
100	9	3	15	750	1	0	0
150	3	2	6	1,000	3	0	0
175	1	0	0	1,100	1	0	0
200	3	0	0	1,400	1	0	0
300	1	0	0	1,800	3	1	1

Remarks.—This species was generally distributed in the oceanic area, but was never very abundant in any haul. The majority of the specimens were caught between 50–150 meters which would appear to be the zone of its maximum abundance. Only one specimen was taken actually at the surface and only two at less depths than 50 meters, while seven were caught in nets fishing at greater depths than 150 meters. There is a good deal of scattered evidence that this species is a surface form during hours of darkness, particularly in the imma-

ture form (Tattersall, 1924). I have no information as to the times at which the hauls of the *Bache* were made, but the evidence provided by the above records of this species would suggest that they were made during daylight. It therefore seems possible to suggest that *T. tricuspidata* is an epiplanktonic species, with a maximum occurrence at about 100 meters during the hours of daylight, rising to the surface at night.

14. THYSANOPODA MONACANTHA Ortmann

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
	Meters			*Meters*	
10158	600–0	1	10203	75–0	2
10161	100–0	1	10203	150–0	4
10162	150–0	1	10206	400–0	3
10187	200–0	1	10207	400–0	1
10192	100–0	2	10208	100–0	20
10195	100–0	2	10209	100–0	9
10198	175–0	2	10211	500–0	1
10200	75–0	129	10212	300–0	1
10200	500–0	1	10212	500–0	1
10202	75–0	4			

Remarks.—With the single exception of the specimen captured at Station 10158, 600 meters, this species was confined to the oceanic area. None occurred at a greater depth than 500 meters (with the exception noted) and none nearer the surface than 75 meters. As far as these records go, it was most abundant between 75 and 100 meters. All the specimens captured at 75 meters were less than half grown, the largest measuring 17 mm.; but complete adult specimens of 32 mm occurred at 100 meters.

15. THYSANOPODA AEQUALIS Hansen

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
	Meters			*Meters*	
10161	100–0	50	10186	25–0	15
10162	150–0	128	10186	85–0	(2)
10163½	400–0	31	10188	75–0	56
10163½	500–0	3	10192	100–0	27
10166	100–0	45	10192	1,000–0	10
10166	1,100–0	9	10194	50–0	65
10169	50–0	200	10194	100–0	2
10171	75–0	22	10195	100–0	250
10172	1,000–0	4	10200	75–0	7
10172	1,800–0	8	10200	500–0	3
10173	100–0	32	10202	75–0	12
10173	200–0	41	10203	75–0	15
10176	750–0	6	10203	150–0	14
10176	1,800–0	1	10204	150–0	1
10178	(1)	1	10206	400–0	24
10178	50–0	9	10208	100–0	65
10180	75–0	9	10208	700–0	26
10182	75–0	22	10209	100–0	68
10182	1,400–0	3	10209	700–0	17
10182	1,800–0	4	10210	1,000–0	1
10184	50–0	46	10211	500–0	14

[1] Surface. [2] Many.

Analysis of the above records

Depth of net	Total number of hauls	Number of hauls in which species occurred	Total number of specimens	Depth of net	Total number of hauls	Number of hauls in which species occurred	Total number of specimens
Meters				*Meters*			
0	18	1	1	400	3	2	55
25	2	1	15	500	4	3	20
50	5	4	320	600	1	0	0
75	8	8	[1] 500	700	2	2	43
100	9	8	539	750	1	1	6
150	3	3	143	1,000	3	3	15
175	1	0	0	1,100	1	1	9
200	3	1	41	1,400	1	1	3
300	1	0	0	1,800	3	3	13

[1] Approximate.

Remarks.—This species was captured only in the tropical oceanic area in which it appears to be widely and abundantly distributed. It is clearly not a surface form, only one specimen occurring in 18 surface hauls examined. It reaches its maximum abundance between 50 and 150 meters, more than 80 per cent of the specimens coming from between these depths, but it occurred regularly down to the deepest layers examined, though in reduced numbers.

16. THYSANOPODA MICROPHTHALMA G. O. Sars

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
	Meters			*Meters*	
10166	1,100–0	1	10182	1,800–0	3
10172	1,000–0	1	10192	1,000–0	1
10173	200–0	7	10200	500–0	2

Remarks.—Apparently widely but sparingly distributed throughout the oceanic area and confined to the deeper layers, at any rate in the adult condition. The specimens from 200 and 500 meters were all less than half grown, the largest measuring 15 mm. Fully adult specimens were captured at 1,000 meters.

17. THYSANOPODA CORNUTA? Illig

Occurrence.—Station 10166, 1,100–0 m., 3; station 10172, 1,000–0 m., 1; station 10172, 1,800–0 m., 1.

Remarks.—These larvae measure from 8–13 mm. and show many points of resemblance to those described and figured by Hansen (1912, p. 224, pl. 6, figs. 1*a*–1*e*) and Zimmer (1914, p. 419, pl. 26, figs. 55–58). The similarity is close enough to suggest that they belong to the genus *Thysanopoda* and to the group containing the species *T. cornuta* and *T. egregia*, the position assigned to their larvae by both Hansen and Zimmer.

The largest specimen measures 13 mm. in length and differs from Hansen's specimen measuring 14.5 mm. in the following points:

(1) The presence of a very large and powerful spine on the lateral margins of the carapace posterior to the center.

(2) The median spine of the rostral plate is much more produced.

In the first of these points it agrees with the larvae described by Zimmer, which are, however, much smaller in size, measuring 5.5–10 mm. The lateral spine on the carapace is probably a larval character but it is difficult to believe that the difference in size of this spine in my own and Hansen's specimens can be explained entirely by the small difference in total length. It rather suggests that the two larvae belong to separate species.

In the second of the above points my larvae differ from those described by both Hansen and Zimmer, which are in substantial agreement in the form of the rostral plate. The figures which accompany this report will bring out the extent of this difference and it is only necessary to add that the rostral plate is of very much the same form in the smallest as well as the largest specimen.

I can not see any trace of ripple markings on the carapace such as are described and figured by Zimmer in his larvae and my specimens show a further point of difference in that there is no long spine on the dorso-lateral angle of the last abdominal somite, but the epimeral plate is acutely pointed at the postero-lateral angle. In other respects, allowing, of course, for the different degree of development of the appendages due to differing age, my specimens agree fairly well with those of Hansen and Zimmer. Particularly characteristic of my specimens is the clumsy external form and the unjointed narrowly conical flagella of the antennules and antennae. All the specimens are from very deep water.

Genus MEGANYCTIPHANES Holt and Tattersall

18. MEGANYCTIPHANES NORVEGICA (M. Sars)

Occurrence.—Station 10158, 600–0 m., 1 specimen; station 10160, 100–0 m., 12 specimens.

Remarks.—The two stations at which this species occurred are in the coastal region, 10160 in purely coastal waters, 10158 in the region of mixture between coastal and Gulf Stream water. The fact that *M. norvegica* occurred only at these two stations confirms what was previously known of its distribution on the Atlantic coasts of America, where it is conclusively a coastal and not an oceanic Gulf Stream form.

Genus EUPHAUSIA Dana

19. EUPHAUSIA KROHNII (Brandt)

Occurrence.—Station 10158, 600–0 m., 2,000 specimens; station 10160, 100–0 m., many.

Remarks.—The distribution of this species in the area explored by the *Bache* is interesting. It occurred in the same two hauls as *Meganyctiphanes norvegica* and in no others, being replaced in the purely oceanic waters by the closely allied species *E. americana.* The enormous abundance of *E. krohnii* at these two stations coupled with its complete absence in all the other points suggests that possibly it, like *M. norvegica,* should be regarded as a coastal and slope form rather than as an oceanic species. This, however, is not in agreement with previous records, for the species has frequently been recorded from waters which are purely oceanic. Many of Hansen's records (1915) from the west Atlantic off the American coast are from the oceanic water outside the continental shelf. Perhaps the true explanation is that *E. krohnii* is not so much a coastal and slope form as a boreal species representing a northern element in the plankton off the American coast. Its wide distribution in the northern parts of the North Atlantic from America to the European Atlantic slope off Norway and the British Isles supports this view. Its main distribution is, in fact, very similar to that of *M. norvegica* but the latter extends much nearer into the coastal waters on both sides of the Atlantic.

20. EUPHAUSIA AMERICANA Hansen

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
10161	Surface	20	10198	Surface	1
10161	100–0 m	10	10198	175–0 m	10
10162	Surface	1	10200	Surface	320
10162	150–0 m	20	10200	75–0 m	28
10163½	400–0 m	3	10200	500–0 m	5
10166	100–0 m	41	10202	75–0 m	21
10166	1,100–0 m	2	10203	Surface	Several.
10169	50–0 m	2	10203	75–0 m	Few.
10171	75–0 m	3	10203	150–0 m	11
10173	Surface	7	10204	150–0 m	2
10173	100–0 m	3	10205	Surface	41
10176	50–0 m	3	10205	200–0 m	1
10176	750–0 m	6	10206	Surface	34
10176	1,800–0 m	3	10206	400–0 m	15
10178	50–0 m	4	10207	100–0 m	2
10180	Surface	4	10208	do	7
10180	75–0 m	1	10208	700–0 m	9
10182	1,800–0 m	2	10209	Surface	45
10186	25–0 m	2	10209	100–0 m	7
10188	75–0 m	1	10209	700–0 m	17
10192	100–0 m	6	10210	1,000–0 m	2
10194	50–0 m	Few.	10211	Surface	Many.
10194	600–0 m	1	10211	500–0 m	5
10195	100–0 m	50			

Analysis of the above records

Depth of net	Total number of hauls	Number of hauls in which species occurred	Total number of specimens	Depth of net	Total number of hauls	Number of hauls in which species occurred	Total number of specimens
Meters				*Meters*			
0	18	11	[1] 1,000	400	3	2	18
25	2	2	22	500	4	2	10
50	5	4	30	600	1	1	1
75	8	5	54	700	2	2	26
100	9	8	126	750	1	1	6
150	3	3	33	1,000	3	1	2
175	1	1	10	1,100	1	1	2
200	3	1	1	1,400	1	0	0
300	1	0	0	1,800	3	2	5

[1] Approximate.

Remarks.—Although this species occurred in hauls from the greatest depth investigated, it must be regarded essentially as a surface form, over 80 per cent of the specimens being caught with surface nets.

21. EUPHAUSIA BREVIS Hansen

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
10161	Surface	6	10192	100–0 m	1
10161	100–0 m	Few.	10192	1,000–0 m	3
10162	Surface	28	10194	Surface	14
10162	150–0 m	268	10194	50–0 m	Few.
10163½	Surface	100	10194	100–0 m	2
10163½	400–0 m	27	10194	600–0 m	35
10163½	500–0 m	4	10195	100–0 m	70
10166	100–0 m	87	10196	Surface	Several.
10166	1,100–0 m	6	10200	do	320
10169	50–0 m	7	10200	75–0 m	10
10171	75–0 m	53	10200	500–0 m	2
10172	1,800–0 m	9	10202	75–0 m	5
10173	Surface	56	10203	Surface	4
10173	100–0 m	11	10203	150–0 m	2
10173	200–0 m	25	10204	do	1
10176	50–0 m	6	10206	400–0 m	2
10176	750–0 m	6	10207	do	1
10176	1,800–0 m	4	10208	100–0 m	13
10178	50–0 m	21	10208	700–0 m	9
10180	Surface	51	10209	Surface	9
10180	75–0 m	52	10209	100–0 m	17
10182	Surface	1	10209	700–0 m	23
10182	75–0 m	25	10210	1,000–0 m	1
10182	1,400–0 m	7	10211	Surface	Many.
10182	1,800–0 m	30	10211	500–0 m	12
10184	50–0 m	33	10212	300–0 m	1
10186	25–0 m	Many.	10212	500–0 m	3
10188	75–0 m	38			

Analysis of the above records

Depth of net	Total number of hauls	Number of hauls in which species occurred	Total number of specimens	Depth of net	Total number of hauls	Number of hauls in which species occurred	Total number of specimens
Meters				*Meters*			
0	18	12	800	400	3	3	30
25	2	1	100	500	4	4	21
50	5	5	87	600	1	1	35
75	8	6	183	700	2	2	32
100	9	8	220	750	1	1	6
150	3	3	271	1,000	3	2	4
175	1	0	0	1,100	1	1	6
200	3	1	25	1,400	1	1	7
300	1	1	1	1,800	3	3	43

Remarks.—This species is widely distributed in the tropical oceanic area and was found at all depths up to 1,800 meters. It is, however, essentially an upper water form, abundant at the surface but more equally and generally distributed in the upper 200 meters than *E. americana*.

22. EUPHAUSIA MUTICA Hansen

Occurrence

Stations	Depth	Specimens	Stations	Depth	Specimens
10161	Surface	12	10195	100–0 m	30
10161	100–0 m	Few.	10196	Surface	Several.
10162	150–0 m	17	10198	do	10
10163½	Surface	2	10198	175–0 m	33
10163½	400–0 m	3	10200	Surface	50
10166	100–0 m	3	10200	75–0 m	12
10169	50–0 m	6	10202	do	3
10171	75–0 m	5	10203	Surface	Several.
10173	Surface	5	10203	75–0 m	2
10173	100–0 m	3	10203	150–0 m	2
10176	Surface	3	10205	Surface	7
10176	50–0 m	1	10206	do	21
10180	Surface	10	10208	100–0 m	3
10180	75–0 m	10	10208	700–0 m	4
10182	Surface	1	10209	Surface	Many.
10186	25–0 m	1	10209	100–0 m	7
10186	85–0 m	Several.	10209	700–0 m	13
10188	75–0 m	5	10211	Surface	15
10194	50–0 m	Few.	10211	500–0 m	5
10194	100–0 m	1	10212	do	1

Analysis of the above records

Depth of net	Total number of hauls	Number of hauls in which species occurred	Total number of specimens	Depth of net	Total number of hauls	Number of hauls in which species occurred	Total number of specimens
Meters				*Meters*			
0	18	14	250	400	3	1	3
25	2	1	1	500	4	2	6
50	5	3	27	600	1	0	0
75	8	7	67	700	2	2	17
100	9	7	67	750	1	0	0
150	3	2	19	1,000	3	0	0
175	1	1	33	1,100	1	0	0
200	3	0	0	1,400	1	0	0
300	1	0	0	1,800	3	0	0

Remarks.—This species appears to be generally distributed in the tropical oceanic area, but is not so abundant as either *E. americana* or *E. brevis*. It occurs frequently at the surface but is also distributed evenly throughout the upper 200 meters. Below this depth it is comparatively rare and occurred in no haul from a greater depth than 700 meters.

23. EUPHAUSIA TENERA Hansen

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
10158	600–0 m	4	10195	100–0 m	17
10161	100–0 m	50	10196	Surface	15
10162	150–0 m	61	10198	175–0 m	2
10163½	Surface	3	10200	Surface	1,200
10163½	400–0 m	1	10200	75–0 m	148
10163½	500–0 m	1	10200	500–0 m	8
10166	100–0 m	35	10202	75–0 m	60
10169	50–0 m	10	10203	Surface	3
10171	75–0 m	20	10203	75–0 m	16
10172	1,800–0 m	4	10203	150–0 m	36
10173	Surface	1	10204	150–0 m	1
10173	100–0 m	2	10205	Surface	41
10173	200–0 m	3	10206	400–0 m	4
10176	750–0 m	3	10208	100–0 m	31
10180	Surface	4	10208	700–0 m	5
10180	75–0 m	2	10209	Surface	1
10186	85–0 m	8	10209	100–0 m	15
10188	75–0 m	1	10209	700–0 m	24
10192	1,000–0 m	2	10211	Surface	Many.
10194	Surface	2	10211	500–0 m	10
10194	50–0 m	12	10212	do	2
10194	600–0 m	14			

Analysis of the above records

Depth of net	Total number of hauls	Number of hauls in which species occurred	Total number of specimens	Depth of net	Total number of hauls	Number of hauls in which species occurred	Total number of specimens
Meters				*Meters*			
0	18	10	1,300	400	3	2	5
25	2	0	0	500	4	4	21
50	5	3	82	600	1	1	14
75	8	6	195	700	2	2	29
100	9	6	203	750	1	1	3
150	3	3	98	1,000	3	1	2
175	1	1	2	1,100	1	0	0
200	3	1	3	1,400	1	0	0
300	1	0	0	1,800	3	1	4

Remarks.—The vertical distribution of this species is very similar to that of *E. brevis;* it is abundant at the surface but fairly generally distributed in the upper 200 meters.

24. EUPHAUSIA HEMIGIBBA Hansen

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
10158	600–0 m	2	10186	25–0 m	10
10161	Surface	14	10186	85–0 m	Many.
10161	100–0 m	50	10188	75–0 m	28
10162	Surface	2	10192	100–0 m	5
10162	150–0 m	302	10192	1,000–0 m	7
10163½	Surface	21	10194	50–0 m	45
10163½	400–0 m	19	10194	100–0 m	2
10163½	500–0 m	1	10194	600–0 m	1
10166	100–0 m	197	10195	100–0 m	250
10166	1,000–0 m	9	10196	Surface	18
10169	50–0 m	300	10198	175–0 m	8
10171	75–0 m	51	10200	Surface	130
10172	1,800–0 m	3	10200	75–0 m	34
10173	Surface	3	10200	500–0 m	5
10173	100–0 m	86	10202	75–0 m	28
10173	200–0 m	16	10203	do	12
10176	50–0 m	3	10203	150–0 m	13
10176	750–0 m	18	10206	400–0 m	9
10176	1,800–0 m	2	10208	100–0 m	51
10178	50–0 m	19	10208	700–0 m	10
10180	Surface	3	10209	Surface	3
10180	75–0 m	59	10209	100–0 m	23
10182	Surface	15	10209	700–0 m	17
10182	75–0 m	27	10211	Surface	11
10182	1,800–0 m	20	10211	500–0 m	9
10184	50–0 m	25			

Analysis of the above records

Depth of net	Total number of hauls	Number of hauls in which species occurred	Total number of specimens	Depth of net	Total number of hauls	Number of hauls in which species occurred	Total number of specimens
Meters				*Meters*			
0	18	10	220	400	3	2	28
25	2	1	10	500	4	3	15
50	5	5	392	600	1	1	1
75	8	8	289	700	2	2	27
100	9	8	670	750	1	1	18
150	3	2	315	1,000	3	2	16
175	1	1	8	1,100	1	0	0
200	3	1	16	1,400	1	0	0
300	1	0	0	1,800	3	3	25

Remarks.—This species is widely and generally distributed in the tropical oceanic area. While occurring frequently at the surface it appears to reach its maximum abundance at about the 100 meter line and to be mainly an epiplanktonic form.

25. EUPHAUSIA GIBBOIDES Ortmann

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
10162	150–0 m	2	10195	100–0 m	6
10163½	400–0 m	2	10198	175–0 m	2
10166	100–0 m	2	10200	500–0 m	1
10169	50–0 m	1	10202	75–0 m	4
10173	200–0 m	4	10203	150–0 m	5
10184	50–0 m	1	10206	400–0 m	1
10186	85–0 m	1	10208	700–0 m	1

Remarks.—This species is the rarest of the members of the genus captured by the *Bache*. The numbers are too few to enable any generalizations to be made, but it is significant that no specimens were taken at the surface. The species appears to be most frequently caught between 75 and 150 meters and none were caught at a greater depth than 700 meters.

Genus THYSANOËSSA Brandt

26. THYSANOËSSA GREGARIA G. O. Sars

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
10158	600–0 m	66	10176	50–0 m	1
10162	150–0 m	1	10176	750–0 m	42
10163½	400–0 m	10	10176	1,800–0 m	100
10163½	500–0 m	3	10178	Surface	31
10166	100–0 m	14	10180	75–0 m	2
10166	1,100–0 m	17	10208	700–0 m	32
10173	200–0 m	275	10209	700–0 m	29
10176	Surface	1	10211	500–0 m	113

Remarks.—This species appears to be widely and generally distributed throughout the tropical oceanic area, but is a deeper water form than any of the species of *Euphausia*, and, accordingly, was captured in fewer hauls. It occurred in only 6 out of 46 hauls made at depths of less than 200 meters, but in 9 out of 23 hauls at depths from 200 to 1,800 meters. It is interesting to note that it was caught at the surface on two occasions.

Genus NEMATOSCELIS G. O. Sars

27. NEMATOSCELIS MEGALOPS G. O. Sars

Occurrence.—Station 10158, 600–0 m., 500 specimens; station 10160, 100–0 m., 4 specimens.

Remarks.—This species again is a northern or boreal species and was not taken in the tropical oceanic area. It occurred with *Meganyctiphanes norvegica* and *Euphausia krohnii* and this distribution in the waters of the western Atlantic agrees well with previous observation (Bigelow, 1914 (2) and 1917). Its relative abundance to *E. krohnii* at the two depths at which these species occurred is indicative of its greater abundance in deeper water. At 100 meters only four specimens were found among several hundreds of *E. krohnii*, while at 600 meters 500 specimens were caught with about 2,000 of *E. krohnii*. This bears out the relative vertical distribution of the two species noted by Bigelow (1917) from station 10233 over the continental slope off Nova Scotia.

28. NEMATOSCELIS MICROPS G. O. Sars

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
10158	600–0 m	1	10194	600–0 m	3
10162	150–0 m	47	10195	100–0 m	4
10163½	400–0 m	14	10198	150–0 m	3
10163½	500–0 m	2	10200	75–0 m	1
10166	1,100–0 m	1	10200	500–0 m	13
10169	50–0 m	8	10203	150–0 m	1
10172	1,000–0 m	1	10205	200–0 m	8
10173	100–0 m	1	10206	Surface	3
10173	200–0 m	61	10206	400–0 m	30
10176	750–0 m	16	10208	700–0 m	22
10176	1,800–0 m	9	10209	700–0 m	27
10182	1,800–0 m	12	10210	1,000–0 m	1
10188	75–0 m	3	10211	500–0 m	30
10192	1,000–0 m	9			

Remarks.—This species has a vertical distribution very similar to that of *T. gregaria.* It occurred in only 8 out of 46 hauls made at less than 200 meters, but in 17 out of 23 hauls made at greater depths. It appears to reach its maximum distribution between 200–700 meters. It is interesting to note that it was caught at the surface on one occasion.

29. NEMATOSCELIS TENELLA G. O. Sars

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
10162	150–0 m	19	10192	1,000–0 m	2
10163½	400–0 m	7	10194	600–0 m	4
10166	1,100–0 m	5	10200	500–0 m	2
10172	1,800–0 m	3	10206	400–0 m	5
10173	200–0 m	27	10208	100–0 m	1
10176	750–0 m	3	10208	700–0 m	9
10176	1,800–0 m	3	10209	700–0 m	18
10182	1,800–0 m	2	10210	1,000–0 m	1
10192	100–0 m	1	10211	500–0 m	7

Remarks.—This species is widely but sparingly distributed in the tropical oceanic area. It is a more distinctly deepwater form than even *N. microps.* It was never taken at the surface or indeed at any depth less than 100 meters and in only 3 out of 46 hauls made at less than 200 meters. On the other hand it occurred in 15 out of 23 hauls made at depths from 200–1,800 meters.

Genus NEMATOBRACHION Calman

30. NEMATOBRACHION BOOPIS (Calman)

Occurrence.—Station 10158, 600–0 m., 1 specimen; station 10195, 100–0 m., 1 specimen.

Remarks.—This species is apparently much rarer in the western Atlantic than it is in the waters off the European Continent, its place in the former area being taken by the next species.

31. NEMATOBRACHION FLEXIPES (Ortmann)

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
10162	150-0 m	34	10188	75-0 m	5
10163½	400-0 m	11	10194	50-0 m	1
10166	100-0 m	4	10195	100-0 m	17
10171	75-0 m	3	10198	175-0 m	13
10172	1,800-0 m	2	10200	75-0 m	1
10173	100-0 m	8	10203	do	1
10173	200-0 m	33	10206	Surface	1
10180	75-0 m	34	10206	400-0 m	4
10182	75-0 m	1	10209	700-0 m	3
10184	50-0 m	2	10211	500-0 m	4
10186	85-0 m	5	10212	do	1

Remarks.—All the specimens have a spine on the lateral margin of the carapace. This confirms my previous observations on this point and Hansen's definition of the genus will require modification in this respect. The species appears to be widely if sparingly distributed throughout the tropical oceanic area. It is most abundant in the upper 200 meters, 153 out of 178 specimens in this collection or 86 per cent being captured between 200 meters and the surface. Only one specimen was actually taken at the surface and only five at 50 meters. The species therefore appears to be an epiplanktonic form with a maximum distribution between 50 and 200 meters.

32. NEMATOBRACHION SEXSPINOSUS (Hansen)

Occurrence.—Station 10166, 1100-0 m., 1 female, 27 mm.; station 10192, 1000-0 m., 1 male, 23 mm.

Remarks.—Both specimens have a well-developed spine on the lateral margin of the carapace near the posterior end, in this respect agreeing with *N. flexipes*. In addition to the characters enumerated by Hansen as distinguishing these two species it may be mentioned that *N. sexspinosus* possesses a prominent supraocular spine on the lateral margins of the rostral plate immediately over the eye.

N. sexspinosus is among the rarest of Euphausians. Only three specimens have been previously recorded, two from the tropical East Pacific and one from the temperate North Atlantic (Hansen, 1911 and 1912). In all cases the specimens were captured in deep water.

Genus STYLOCHEIRON G. O. Sars

33. STYLOCHEIRON CARINATUM (G. O. Sars)

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
10161	Surface	1	10188	75–0 m	13
10161	100–0 m	20	10192	100–0 m	33
10162	Surface	1	10192	1,000–0 m	3
10162	150–0 m	248	10194	Surface	2
10163½	400–0 m	13	10194	50–0 m	34
10163½	500–0 m	1	10194	100–0 m	26
10166	100–0 m	64	10194	600–0 m	10
10166	110–0 m	2	10195	100–0 m	100
10169	50–0 m	50	10198	175–0 m	5
10171	75–0 m	1	10200	75–0 m	317
10172	1,800–0 m	1	10200	500–0 m	10
10173	100–0 m	20	10202	75–0 m	25
10173	200–0 m	29	10203	75–0 m	16
10176	750–0 m	10	10203	150–0 m	19
10176	1,800–0 m	6	10205	200–0 m	3
10178	Surface	1	10206	400–0 m	10
10178	50–0 m	20	10207	100–0 m	5
10180	Surface	2	10208	do	44
10180	75–0 m	35	10208	700–0 m	17
10182	75–0 m	12	10209	100–0 m	84
10182	1,400–0 m	4	10209	700–0 m	18
10182	1,800–0 m	4	10210	1,000–0 m	2
10184	50–0 m	51	10211	500–0 m	8
10186	85–0 m	63	10212	300–0 m	1
10187	200–0 m	10	10212	500–0 m	80

Analysis of the above records

Depth of net	Number of hauls	Number of hauls in which species occurred	Number of specimens	Depth of net	Number of hauls	Number of hauls in which species occurred	Number of specimens
Meters				*Meters*			
0	18	5	7	400	3	2	23
25	2	0	0	500	4	3	99
50	5	4	145	600	1	1	10
75	8	8	482	700	2	2	35
100	9	9	576	750	1	1	10
150	3	2	267	1,000	3	2	5
175	1	1	5	1,100	1	1	2
200	3	3	52	1,400	1	1	4
300	1	1	1	1,800	3	3	11

Remarks.—This species is obviously very widely and generally distributed in the tropical oceanic area. It occurred in 72 per cent of the hauls examined and at all depths from the surface down to 1,800 meters. It is, however, clearly an upper water form, rarely taken at the surface and most abundant between 50 and 200 meters with a maximum at about the 100-meter line

34. STYLOCHEIRON ELONGATUM G. O. Sars

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
10163½	400-0 m	9	10200	500-0 m	7
10172	1,800-0 m	2	10206	400-0 m	6
10176	750-0 m	3	10208	700-0 m	11
10176	1,800-0 m	5	10209	do	7
10182	do	4	10211	500-0 m	9
10194	600-0 m	10	10212	do	3
10200	75-0 m	1			

Remarks.—This species is comparatively rare but widely distributed in the tropical oceanic area. It is a deep-water form, only a single specimen occurring in 46 hauls taken above 400 meters, while it occurred in 50 per cent of the hauls taken below that depth. Its maximum of distribution seems to lie between 400 and 700 meters.

35. STYLOCHEIRON SUHMII G. O. Sars

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
10162	150-0 m	46	10186	85-0 m	4
10163½	400-0 m	4	10188	75-0 m	4
10163½	500-0 m	1	10194	600-0 m	3
10166	100-0 m	13	10200	75-0 m	4
10171	75-0 m	2	10203	150-0 m	1
10173	200-0 m	13	10205	200-0 m	3
10182	Surface	1	10208	700-0 m	1
10182	75-0 m	2	10209	100-0 m	1
10182	1,400-0 m	1	10209	700-0 m	7
10182	1,800-0 m	2	10211	500-0 m	1

Remarks.—This species is widely distributed in the tropical oceanic area, but never very abundantly. It occurred in about an equal number of hauls above and below the 200-meter line, but whereas 104 specimens were taken between 200 meters and the surface, only 20 specimens occurred below that depth. It is most abundant between 100 and 200 meters.

36. STYLOCHEIRON LONGICORNE G. O. Sars

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
10162	150-0 m	5	10192	50-0 m	1
10163½	400-0 m	4	10194	600-0 m	11
10163½	500-0 m	1	10200	500-0 m	4
10166	1,100-0 m	4	10206	400-0 m	17
10172	1,800-0 m	2	10207	do	1
10173	200-0 m	87	10208	700-0 m	2
10176	750-0 m	4	10209	do	16
10176	1,800-0 m	4	10210	1,000-0 m	1
10178	50-0 m	1	10211	500-0 m	17
10182	Surface	8	10212	do	3
10187	200-0 m	16			

Remarks.—This species has a distribution in the area explored very similar to that of *S. suhmii*. It is, however, rather more abundant than the latter and appears to have its maximum of abundance in somewhat deeper water. It occurred in only 4 out of 46 hauls made at less than 200 meters, but in 17 out of 23 hauls between 200 and 1,800 meters. It is most abundant between 200 and 500 meters.

37. STYLOCHEIRON ABBREVIATUM G. O. Sars

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
10162	150–0 m	54	10200	500–0 m	4
10163½	400–0 m	6	10203	150–0 m	3
10163½	500–0 m	1	10205	200–0 m	4
10166	100–0 m	3	10206	400–0 m	10
10166	1,100–0 m	2	10207	do	4
10173	200–0 m	33	10208	100–0 m	5
10176	750–0 m	2	10208	700–0 m	6
10182	1,400–0 m	1	10209	100–0 m	2
10182	1,800–0 m	1	10209	700–0 m	2
10187	200–0 m	9	10210	1,000–0 m	1
10192	1,000–0 m	1	10211	500–0 m	17
10195	100–0 m	10	10212	do	1

Remarks.—The distribution of this species in the tropical oceanic area is practically the same as that of *S. longicorne*. It was not taken at depths of less than 100 meters and appears to be most abundant between 100 and 500 meters.

38. STYLOCHEIRON MAXIMUM Hansen

Occurrence

Station	Depth	Specimens	Station	Depth	Specimens
10163½	500–0 m	1	10200	500–0 m	1
10166	1,100–0 m	1	10206	400–0 m	3
10187	200–0 m	1	10208	700–0 m	5
10192	1,000–0 m	2	10209	do	5

Remarks.—This species is widely distributed but comparatively rare in the area explored. It is a deep-water form, all the specimens being taken below 200 meters.

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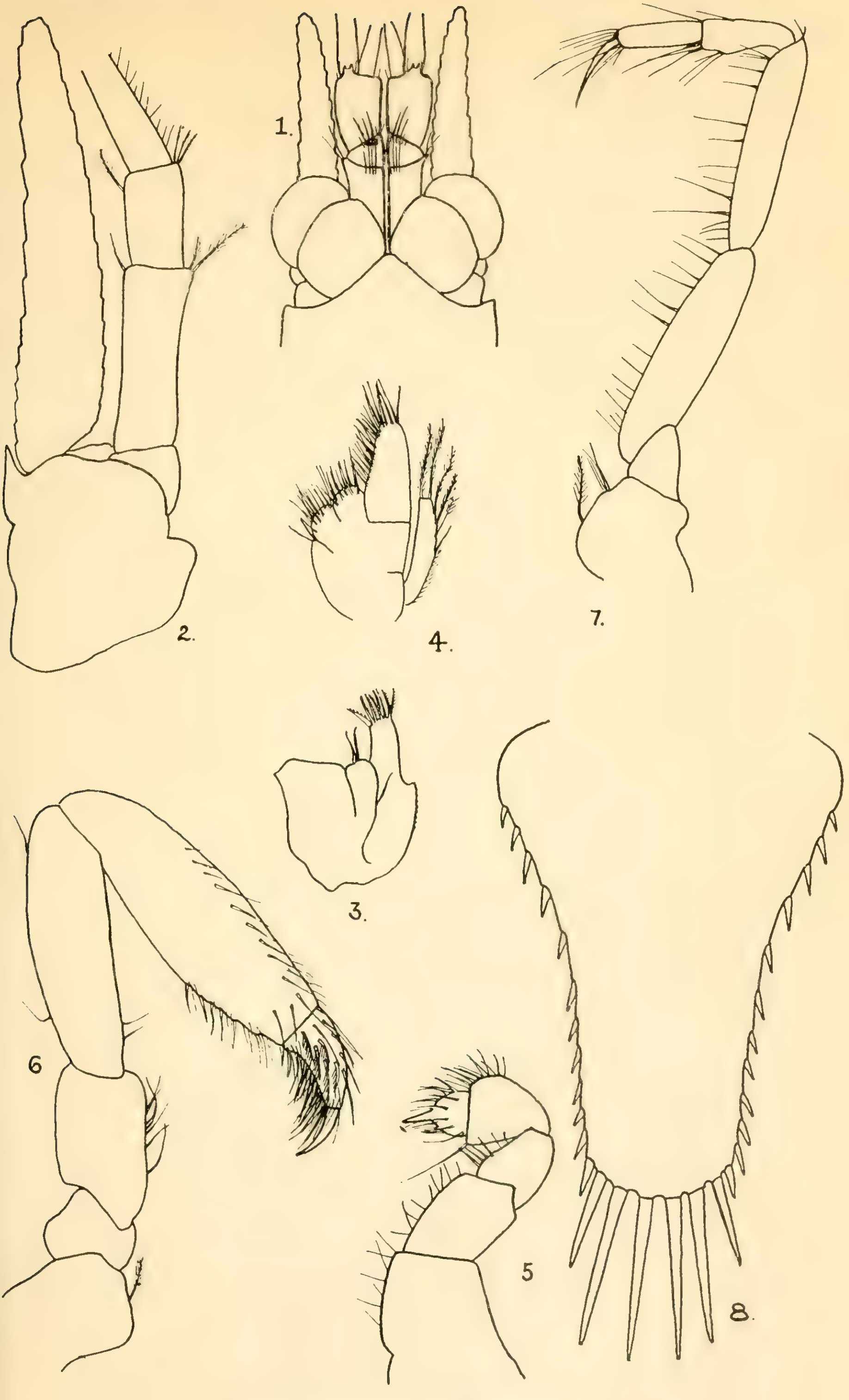
EXPLANATION OF THE PLATES

Plate 1

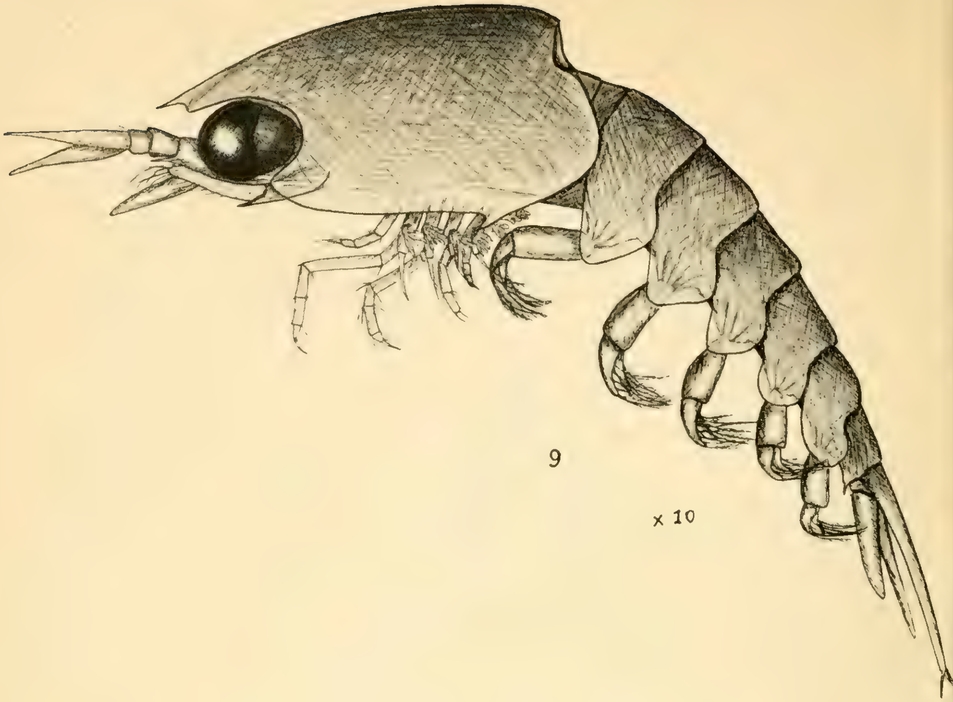
Mysidopsis bigelowi, new species

Fig. **1.** Anterior end, dorsal view. × 33.
2. Antennal scale and peduncle. × 65.
3. Maxillula. × 65.
4. Maxilla. × 65.
5. Endopod of first thoracic limb. × 65.
6. Endopod of second thoracic limb. × 65.
7. Endopod of third thoracic limb. × 65.
8. Telson. × 100.



MYSIDOPSIS BIGELOWI, NEW SPECIES

FOR EXPLANATION OF PLATE SEE PAGE 30



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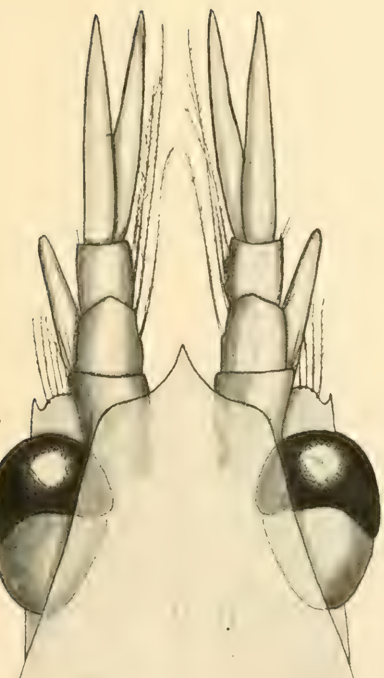

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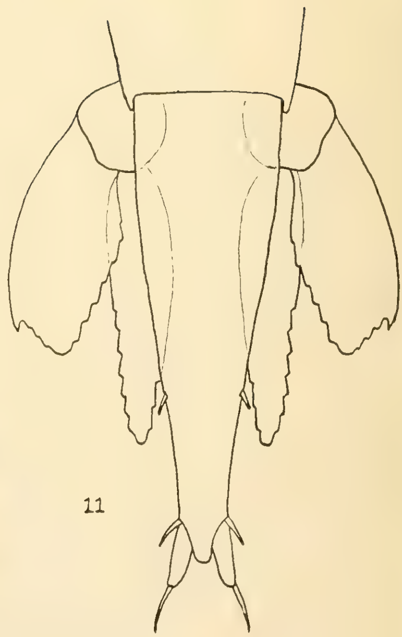

11

YOUNG SPECIMEN OF THYSANOPODA

FOR EXPLANATION OF PLATE SEE PAGE 31

PLATE 2

Thysanopoda, young specimens (?*cornuta* Illig)

FIG. 9. Lateral view of specimen 13 mm. $\times$ 10.
10. Dorsal view of anterior end of the same specimen. $\times$ 10.
11. Telson and uropods of the same specimen. $\times$ 25.

REVIEW OF THE AMERICAN XYLOTINE SYRPHID-FLIES

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INTRODUCTION

A revised synopsis of all of the American species of the tribe Xylotini is here presented. It is based primarily upon the extensive collection in the United States National Museum and studies made upon the type material of Syrphidae in the British Museum (Natural History) and the Museum of Comparative Zoölogy, Cambridge, Massachusetts, further supplemented by the loan of material from various sources.

The writer wishes to cordially thank the following gentlemen: Maj. E. E. Austen for permission to examine the collection of Diptera in the British Museum in which the types of the species described by Walker, Bigot, and Williston (the Biologia Centralia Americana Syrphidae) are located, for the free use of his manuscript notes pinned in the collection with the specimens and also for the loan of undescribed material; Samuel Henshaw and Nathan Banks for the facilities they afforded the writer while examining the Osten Sacken-Loew collection in the Museum of Comparative Zoölogy, Cambridge, Mass.; Prof. J. Herve-Bazin, Prof. J. S. Hine and C. W. Johnson for the loan of material; and Dr. E. A. Schwarz and Dr. J. M. Aldrich for kindly criticism and suggestions.

Citations relating to synonomy and new species are given only where they are subsequent to the Aldrich (North American Diptera, 1905) and the Kertesz (Catalogus Dipterorum, vol. 7, 1910) catalogues. References are several times made to "The Genitalia of Male Syrphidae" by C. L. Metcalf [1] and papers illustrating pupae of various species of Syrphidae by C. T. Greene.[2] Locality records are so numerous for Syrphidae, that in order to reduce the space required for them, they have been listed by state only, except in the case of new or little known species.

[1] Ann. Ent. Soc. Amer., vol. 14, p. 169, 1921.
[2] Proc. Ent. Soc. Wash., 1920–1923.

The Xylotine tribe of Syrphidae is characterized by a dorsal arista on a usually suborbicular third antennal joint; face more or less flat or raised to a median keel, in profile ranging from straight to concave; epistoma truncated; face bare except for sparse hairs along eye margins; marginal cell open; discal crossvein joining discal cell at or beyond its middle, rarely before; hind femur usually enlarged, frequently greatly swollen, and spinose along lower surface; body without black and yellow wasplike markings; males with protuberances on hind legs, which may occur on metasternum, trochanters, femora, or tibia, very rarely on coxae; males with only four visible abdominal segments.

The name Xylotini and the definition of the tribe has been used in rather a broad sense in order to include *Teuchocnemis*, *Pterallastes*, *Tropidia*, *Syritta*, *Xylota*, *Brachypalpus*, *Calliprobola*, and *Pocota*. Four additional genera are also recognized and included in the North American fauna: *Xylotomima*, new genus (*Xylota*, in part); *Xylotodes*, new genus (*Brachpyalpus*, in part); *Hadromyia* Williston (*Pocota*, in part); *Planes* Rondani (*Syritta*, in part, tropical).

The South American genera consist of *Tropidia* (*Ortholophus* Bigot), *Acrochordonodes*, *Stilbosoma*, *Planes*, *Sterphus*, *Crepidomyia* (new genus), *Philippimyia* (new genus), *Tatuomyia* (new genus), and *Eriophora* Philippi.

Because of the great difference between the faunas of South America and the rest of America, including the West Indies, the faunas of the two regions have been treated separately. It is of interest to note that in America the genera *Xylota* and *Xylotomima* (*Xylota*, in part), as here understood, occur only in the Nearctic region (several Mexican species occur at high altitudes) while other genera *Planes*, *Crepidomyia*, *Sterphus*, presumably take their place in tropical America.

NORTH AMERICAN AND WEST INDIAN XYLOTINI

The four additional genera, noted above, *Planes* Rondani (tropical), *Xylotomima*, new genus (*Xylota*, in part), *Xylotodes*, new genus (*Brachypalpus*, in part), and *Hadromyia* Williston (*Pocota*, in part) are recognized and included in the North American fauna on the following grounds: *Planes* was made a synonym of *Syritta* by Williston; but the type species and its congeners (all tropical) have been assigned to *Xylota* and *Syritta*. It proves to be intermediate between *Xylota* and *Syritta* but is a well-defined group.

The characters here used to define the different groups of Xylotini bring about the division of *Xylota* and *Brachypalpus* into two genera each, *Xylota* and *Xylotomima*, *Brachypalpus* and *Xylotodes*, respectively. These four groups are fully equivalent to the other

genera in the tribe. The change in generic concept is based on a character found on the metasternum. The tribe Xylotini may be divided into six genera according to whether the metasternum bears pile or is faintly pubescent or bare. *Xylotimima* and *Xylotodes* have the metasternum pilose; *Xylota* and *Brachypalpus* have it pubescent or bare. Supplementary characters are given in the generic descriptions. It seems unfortunate to divide such well-known genera as *Xylota* and *Brachypalpus* but in view of the method of treatment for the Xylotini as given here, there would be only one other alternative. This would be to make *Syritta*, *Planes*, *Brachypalpus*, and *Calliprobola*, as well as *Xylotomima* and *Xylotodes*, subgenera of *Xylota.* In either case there would be the same number of groups; and seemingly the plan adopted is the better of the two.

Hadromyia Williston was established for an American species, *grandis* Williston, but was subsequently made a synonym by Williston of the European genus *Pocota. Pocota bombiformis* Hunter was described at a later date. The latter is congeneric with *Pocota apiformis* Schrank (genotype of *Pocota*). In both species the apical cross-vein joins the third longitudinal vein at the very edge of the wing; the head is small and narrower than the width of the thorax. *Hadromyia grandis* differs noticeably in the wing venation and the head is somewhat broader than the anterior of the thorax; furthermore the metasternum is normal in *Hadromyia*, but greatly reduced in *Pocota apiformis* and *bomboides. Pocota* (*sensu stricto*) appears to be more closely allied to the Criorrhinini than to the Xylotini.

Observations on certain Helophilini (Eristalinae) which were described under *Pterallastes* are given in the discussion of that genus.

The tribe Xylotini is one of admitted difficulty. Confusion, in some cases of a very great degree, exists among the majority of the species, particularly in *Xylota* and *Xylotomima.* Thirty-two species of these two genera, five of which are new, are here definitely recognized. Forty-seven names have been previously applied to North American material, of which types and authentic specimens of twenty-seven species have been examined. Of the remainder nine are synonyms and nine Nearctic species have been transferred to other genera.

The examination of Walker's and Bigot's types produced several suprising results. A number of well established names in modern literature will have to give way to their names. The failure of the attempts of Dipterists to unravel the species proposed by them prove how untrustworthy are the generic locations and descriptions of their species.

The chief, confusion, aside from the misunderstanding of the Walker and Bigot types, has come about through the use of color

markings for specific characterization, particularly the yellow abdominal spots in certain species. These have proved very variable, especially in the female, where they may be completely obscured by the bluish-black coloration. The following remarks pertain to the most involved tangle that has arisen in this study.

In Williston's "Synopsis of North American Syrphidae" he described *elongata* as a new species and recorded two positive specimens from New Hampshire and Pennsylvania. Later Williston[3] placed *elongata* as a synonym of *angustiventris* Loew. These two specimens, now in the National Collection, prove to be two species. The New Hampshire one is a female of *angustiventris* and is most probably the specimen upon which Williston based the synonomy. At this time he evidently redetermined the Pennsylvania specimen as *anthreas*, for this specimen now stands in the collection with the label "*Xylota anthreas* Walk." in Williston's handwriting. (This specimen and others like it are treated here under the name *ejuncida*, variety *elongata*. See *Xylota ejuncida* two paragraphs below.) Subsequent writers, however, have not accepted Williston's synonomy and have continued to recognize *elongata* (=female *angustiventris*) as a valid species. Metcalf in his "Syrpidae of Ohio" separates "*elongata*" from *angustiventris* on the ground that it lacks the yellow spots which are present in *angustiventris*. But, as Williston writes and as the material at hand shows, only the male *angustiventris* has yellow spots, whereas the female has the abdomen entirely dark; furthermore in Metcalf's records he has only males for *angustiventris* and females for *elongata*. The large third antennal joint which Metcalf notes for "*elongata*" is a striking characteristic of both sexes of *angustiventris*.

The real *Xylota anthreas* Walker, incorrectly described from a single male, proves to be the same species that Coquillett later described as *Xylota fascialis*. The type specimen of *anthreas* is somewhat discolored but the yellow face and yellow abdominal markings (which typify the type of *fascialis*) are easily discernible. Walker, however, makes no mention of the partly yellow face and states that the sides of the abdomen are "adorned with large steel blue spots." This mischaracterization has proved very misleading; while at the same time Williston's conception of *anthreas* has given rise to the so-called *anthreas* of subsequent publications. It may be that Walker had some other species before him at the time he described *anthreas*, but this hardly seems to be the case as no North American species fits his description.

Xylota anthreas, in Williston's sense, as already indicated, proves to be a different species. Williston determined a female *Xylota* as

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[3] Ent. News, vol. 3, p. 146, 1892.

this species, and based his description of *anthreas* in his "Synopsis of Syrphidae" upon this specimen. Walker wrote that the arista of *anthreas* was black; Williston stated that the arista of his specimen was yellow at the base. The yellow base of the arista has been taken as the chief point of diagnosis for *anthreas* in subsequent keys of the species of this genus. A certain specimen of the Williston collection bearing the locality "White Mountains, Jackson, N. H." (Williston gives only "New Hampshire" in his Synopsis) and standing under the species *anthreas*, is in all probability, the same as that upon which Williston based his description. But, in this specimen, the arista is not yellow at base but dark brown along its entire length. Finally, it proves to be conspecific with the "Pennsylvanian" specimen, which Williston described under *elongata* and subsequently redetermined as *anthreas*. Williston's *anthreas* then becomes *ejuncida elongata* Williston.

In *Xylota ejuncida* Say, the yellow abdominal markings appear to be very variable, especially in the female, at times becoming entirely obscured by a bluish-black metallic coloration. As the "Pennsylvanian" specimen of "*elongata*" and Williston's specimen of "*anthreas*" differ from *ejuncida* only in the color of the abdomen—a variable character—it is here proposed to consider them as a variety of *ejuncida*. Since the "Pennsylvanian" specimen was one of the types of *elongata*, the name *elongata* is retained for the varietal name for the dark-bodied form of *ejuncida*.

Xylota baton Walker, formerly placed as a synonym of *ejuncida* Say, proves to be *Xylota fraudulosa* Loew, over which it has priority.

The status of the species involved in this complication is as follows:

Xylota ejuncida SAY, Amer. Entom., vol. 1, pl. 8; compl. Works, vol. 1, p. 15. A species recognized in this paper.

Xylota anthreas WALKER, List III, 1849, p. 556. Synonym, *Xylota fascialis* Coquillett.

Xylota angustiventris LOEW, Centuries 6, 58. A recognized species. Female usually determined as *elongata* Williston.

Xylota subfasciata LOEW, Centuries, 6, 57. A recognized species. Sometimes determined as *ejuncida* Say.

Xylota quadrimaculata LOEW=*ejuncida* Say.

Xylota annulifera BIGOT=*ejuncida* Say.

Xylota elongata WILLISTON=*angustiventris* Loew and dark-bodied *ejuncida* Say, recorded here as *Xylota ejuncida elongata* Williston.

Xylota anthreas WILLISTON (not Walker)=*ejuncida elongata* Williston.

Xylota elongata of authors=female *angustiventris* Loew.

Xylota anthreas of authors=female *baton* Walker? and *ejuncida* Say.

Xylota flavifrons WALKER.

Synonyms: *Xylota communis* Walker and *obscura* Loew.

Williston thought *flavifrons* might be *elongata*=*angustiventris*.

EXPLANATION OF NEW OR LITTLE USED CHARACTERS OF XYLOTINI

Metasternum pilose or pubescent.—This character in the Syrphidae may be of specific, subgeneric, or generic value. The metasternum (posterior antecoxal piece) located between the middle and hind coxae is either faintly pubescent or clothed with pile which approximates the length of the pile on the hind coxae.

Metasternal sclerite divided.—In *Tropidia* each metasternal sclerite is divided on its lower portion by a fairly distinct, narrow band of membrane.

Metasternal sclerites spurred.—The middle portion of each sclerite is produced into more or less well-defined spur. Occurs in certain males of *Planes.*

Hind trochanter with spur.—This character occurs in the males of certain species of *Helophilus*, *Tropidia*, *Xylota*, etc. It is usually spoken of in keys and descriptions as " hind coxa with a spur," which is erroneous, as the coxa is simple in all American forms of Xylotini except in *Acrochordonodes* and *Stilbosoma.*

Hind tibia toothed.—The hind tibia at apex on lower side may be produced into a single median tooth (*Planes*) or may be developed into two teeth-like projections, one at each corner (*Tatuomyia*). In other cases the lower apex may have a single tooth on the inner corner (*Crepidomyia*) or may be truncate (*Eriophora*) or there may be a gentle concavity (*Sterphus*).

Pleurotergite with ridge.—The pleurotergite is the sclerite which lies between the attachment of the lower squama and the metathoracic spiracle. The ridge is a sharp one extending diagonally from the spiracle upwards and backwards towards the anterior lower corner of the scutellum. Occurs in *Syritta* and certain tropical species of *Planes* and to some extent in some species of *Tropidia.*

Fifth abdominal segment of female submembranous.—The females of *Tropidia* appear to have the fifth abdominal segment reduced in size, and much less chitinized than the preceding ones and more or less retracted within the fourth. *Syritta pipiens* also shows this condition to some extent and *Syritta oceanica* has it still more pronounced.

Head broadly elliptical or triangular.—The frontal aspect of the head should be viewed.

Face concave.—Face taken in profile.

Lower face.—That part of the face lying between the lower eye margin and oral margin.

Arista longer than width of face.—The width of the face taken is that across its middle.

Metathoracic spiracle smaller or larger than third antennal joint.—It may be noted that the two extremes occur in *Xylotomima pigra* (smallest) and *Xylota barbata* (largest).

Lower face.—The region between the lower margin of the eye and the lateral mouth margin.

Apical cross vein.—That part of the third vein beyond the point of juncture of the posterior cross vein and the fourth vein. It may be in line with the posterior cross vein or it may have a basal angle which throws it out of alignment with the posterior cross vein.

KEY TO THE GENERA OF NORTH AMERICAN XYLOTINI

A^1. Sixth vein, beyond anal cell, evanescent some distance from wing margin; stigmatical cross vein fairly distinct; metasternum pilose__**Teuchocnemis.**

A^2. Sixth vein attaining wing margin.

B^0. Mesonotal tegument ochraceous; stigmatical cross vein present; metasternum bare; length of petiole beyond anal cell a little longer than discal cross vein____**Pterallastes.**

B^2. Mesonotal tegument not ochraceous; stigmatical cross vein absent; anal cell petiole shorter than discal cross vein.

C^1. Metasternum pilose; hind trochanters of male not spurred (except rarely in *Tropidia*).

D^1. Hind femur on outer side with an apical saw-toothed process; each metasternal sclerite divided by a membranous band; fifth tergite of female small, membranized and nearly hidden under fourth tergite; face subcarinate to carinate_________**Tropidia.**

D^2. Hind femur without saw-tooth process, etc.

E^1. Face subcarinate; sternites very narrow; hind femur greatly enlarged; anal furrow usually much shortened; pleurotergite with sharp ridge; ocellar triangle of male unusually long and narrow.

F^1. Wings nearly devoid of villi, glassy in appearance; arista shorter than width of face____________________**Syritta.**

F^2. Wings villose, not glassy; arista distinctly longer than width of face (Tropical)____________________**Planes.**

E^2. Face without any semblance of carina; sternites not unusually narrow; anal furrow not shortened; pleurotergite without ridge; ocellar triangle of male normal.

F^1. Head broadly elliptical; body pile inconspicuous (*Xylota*, in part, type *Xylota vecors* Osten Sacken)_**Xylotomima.**

F^2. Head triangular; pile usually fairly long and rather dense (*Brachypalpus*, in part, type *inarmatus* Hunter) **Xylotodes.**

C^2. Metasternum faintly pubescent or bare (hind trochanters of male spurred in *Xylotodes* and *Xylota* except in *X. bicolor*).

D^1. Not bumble-bee-like; without contrasting yellow and black mesonotal pile.

E^1. Abdomen and sometimes the thorax bright brassy aeneous; face largely yellowish______________________**Calliprobola.**

E^2. Abdomen not bright brassy aeneous; face rarely with yellow.

F^1. Head triangular; arista much shorter than width of face; metathoracic spiracle distinctly smaller than third antennal joint; hind femur swollen and with obtuse spur apically and ventrally; front of female broad. (*Brachypalpus, sensu stricto*)_________**Brachypalpus.**

F². Head broadly elliptical; arista as long or longer than width of face; metathoracic spiracle as large or larger than third antennal joint; hind femur without spur and usually slender (type *X. segnis* (Linnaeus)) **Xylota.**

D². "Bumble-bee flies" with dense yellow pile on anterior half and black pile on posterior half of mesonotum.

E¹. First posterior cell closed some distance before wing margin, a distinct petiole beyond; metasternum fully developed **Hadromyia.**

E². First posterior cell closed practically at wing margin; metasternal sclerites much narrower than long____**Pocota.**

Genus TEUCHOCNEMIS Osten Sacken

TEUCHOCNEMIS BACUNTIUS Walker

Usually a more robust species than *lituratus*, thorax and abdomen rather heavily marked with reddish brown. A rather rare species found in the early spring. New Jersey, Maryland, Virginia, North Carolina, Georgia, Texas.

Type.—In Museum Comparative Zoölogy, Cambridge, Mass.

TEUCHOCNEMIS LITURATUS Loew

Differs from *bacuntius* by its entirely bluish-black abdomen. Fairly common throughout northeastern America. Not reported south of Virginia.

Type.—In Museum Comparative Zoölogy, Cambridge, Mass.

Genus PTERALLASTES Loew

Four North American species have been assigned to this genus, but from the present study it is evident that it should be restricted to the original species, *thoracius* Loew. The other species, *curvipes* Wiedemann (*Polydontomyia*), *perfidiosus* Hunter and *borealis* Cole belong to the tribe Helophilini, subfamily Eristalinae and not to the Xylotinae. Characters which these three non-*Pterallastes* species possess which ally them to Helophilini are: Face pilose, in profile concave below the antennae, raised to an inconspicuous tubercle and thence straight and slightly receding to the epistoma; third vein deeply bent; hind femora greatly thickened, hind tibia arcuate.

P. perfidiosus and *borealis* were described from females only. No material is at hand for either species. They may prove to be conspecific with certain species of *Helophilus*, and if *borealis* proves to belong to the genus *Helophilus* the name would have to be changed as *borealis* is preoccupied in that genus.

Other characters which ally *Polydontomyia curvipes* to the Helophilini and which may be shared by *perfidiosus* and *borealis* are: Males broadly dichoptic; front of female unusually broad and ocelli

widely spaced; bases of all the femora with spinose areas; anal cell broadened, the lower vein bowed downward; scutellum 3–5 times as broad as long.

An unusual character may be noted here for the female of *Polydontomyia curvipes.* The first and third abdominal sternites are greatly swollen, whereas the second is reduced and deeply sunken between the first and third, thus forming a broad deep channel.

Pterallastes differs from the Helophilini by: Males holoptic; front and ocelli of female normal; face of female concave from antennae to oral margin, small tubercle in the male; slopes of face without pile; spinose area at base of femora not so pronounced; hind femur but little thickened, hind tibia very slightly bowed; scutellum about twice as broad as long; third vein not deeply curved; anal cell not unusually broadened, its lower vein nearly straight.

PTERALLASTES THORACICUS Loew

A fairly common species in the eastern part of the United States. Not recorded from Canada or south of North Carolina.

Type.—In Museum of Comparative Zoölogy.

Genus TROPIDIA Meigen

KEY TO THE SPECIES OF THE GENUS TROPIDIA MEIGEN

A1. First tergite entirely black; scutellum not edged with yellow; small species 4.5–9 mm.
- B1. Abdomen largely red -- incana Townsend.
- B2. Abdomen largely black or with yellow markings.
  - C1. Second and third tergites with small yellowish or reddish marking on anterior corners; tarsi broad ------------------ montana Hunter.
  - C2. Second and third tergites with large yellow markings.
    - D1. Hind margins of tergites 2, 3, and 4 bright yellow; species of average size -------------------------------- coloradensis (Bigot).
    - D2. Hind margins not strikingly yellow; very small species. pygmaea, new species.

A2. First tergite with yellow lateral margins; scutellum edged with yellow; usually larger species, 10–12 mm.
- B1. Males.
  - C1. A large basal spur on ventral surface of hind femur, 10–12 mm. mamillata Loew.
  - C2. Without such spur.
    - D1. Hind trochanter produced spur-like --------- calcarata Williston.
    - D2. Hind trochanter not produced.
      - E1. Hind femora entirely black ------------------ quadrata (Say).
      - E2. Hind femora reddish at base ------------ albistylum Macquart.
- B2. Females.
  - C1. Frontal aspect of face dark.
    - D1. Fourth tergite grayish pollinose; wings infuscated; third joint broader than front across ocelli; 10–11 mm. calcarata Williston.

D². Fourth tergite shining bronze; wings nearly hyaline; third joint narrower than front across ocelli; 8 mm.____**mamillata** Loew.

C². Frontal aspect of face partly yellow.

D¹. Hind femur reddish at base; front unusually long and narrow. **albistylum** Macquart.

D². Hind femur entirely black; front not unusually long and narrow (sometimes 8 mm., usually 10–12)__________**quadrata** (Say).

TROPIDIA INCANA Townsend

Described from Fort Collins, Colorado. Specimens at hand: 2 males, 2 females, Florissant, Colorado, June 24, 1907 (S. A. Rohwer).

Type.—Location unknown.

TROPIDIA MONTANA Hunter

Type locality.—Moscow, Idaho. Has been taken subsequently, same locality, April 30–May 17 (J. M. Aldrich).

Type.—University of Nebraska.

TROPIDIA COLORADENSIS (Bigot)

Xylota coloradensis Bigot, Ann. Soc. Ent. France, ser. 6, vol. 3, 1883, p. 544.

Very closely allied to *T. montana* Hunter. Described from Colorado. Not since recorded.

Type.—In British Museum.

TROPIDIA PYGMAEA, new species

Male.—Unusually small, dark species with yellow abdominal markings. Ocellar triangle black with rather short, sparse pile; frontal triangle and face black with white pollinosity; antennae small, first two joints dark brown, third yellowish brown; arista about length of antenna, brown; face very prominent, with rather gentle slopes, keel not sharp, straight from antennae to oral margin. Thorax entirely shining black, mesonotum with very short, light pile; legs black except extreme apices of femora and bases of tibiae; legs slender hind femur although swollen is less so than any of its congeners; abdomen black, second and third tergites with large yellow markings extending over the sides; hind margin of fourth tergite yellow; wings slightly smoky; squamae white; halterers faintly yellow. Length 4.5 mm.; wing 3.75 mm.

Holotype, male, Soldiers Summit, 7,454 feet, Utah, July 6, (J. M. Aldrich).

Type.—Cat. No. 27311, U.S.N.M.

The unusual size, the very short thoracic pile, slender tarsi and abdominal markings easily identify this species.

TROPIDIA MAMILLATA Loew

Type locality.—Illinois; published records: Nebraska (Hunter, Jones); Kansas (Snow, Hine); North Carolina (Brimley); additional record: Chicago, Illinois, September 7, 1914 (A. Kwiat).

Type.—In Museum of Comparative Zoölogy.

TROPIDIA CALCARATA Wiliston

Type locality.—Galesburg, Michigan (Dimmock); published records: New Jersey (Smith, Johnson); Northern Indiana (R. M. Smith); material at hand: Swansea, South Carolina, on flowers of yellow water lily, August 9, 1911 (F. Knab); Ann Arbor, Michigan, June 26, 1917, on *Crataegus* (E. G. Anderson).

Type.—In United States National Museum.

TROPIDIA ALBISTYLUM Macquart

Type locality.—North America; published records: New Jersey (Smith); Florida (Johnson); flowers of *Cephalanthus*, Lake Forest, Illinois (Needham); District of Columbia, Maryland, Virginia (Banks, Greene, McAtee, Shannon); North Carolina (Metcalf); additional records: Georgia (H. K. Morrison); White Springs, Florida, October 18 (C. H. T. Townsend); Louisiana; Wolf City, Texas, April 12, 1906 (F. C. Bishopp); Durant, Oklahoma, June 2, 1905 (C. R. Jones, F. C. Bishopp).

Type.—In Natural History Museum, Paris. (?)

TROPIDIA QUADRATA (Say)

Type locality.—Pennsylvania. The commonest species of this genus apparently occurring throughout the United States and southern Canada.

Type.—Lost.

Genus SYRITTA St. Fargeau and Serville

SYRITTA PIPIENS (Linnaeus)

A cosmopolitan species, widely distributed throughout North America.

Type.—Linnaean Society of London (?)

SYRITTA OCEANICA Macquart

May be found eventually to occur in southern America.

Type.—In Natural History Museum, Paris (?).

AMERICAN SPECIES INCLUDED IN THE KERTESZ CATALOGUE UNDER SYRITTA, WHICH ARE HERE REFERRED TO OTHER GENERA

S. americana Schiner=*Planes vagans* (Wiedemann)?
S. mexicana Bigot=*Planes vagans* (Wiedemann)?
S. transversa Walker=*Zonemyia transversa* (Walker).
S. vagans (Wiedemann)=*Planes vagans* (Wiedemann).

Genus PLANES Rondani

Planes Rondani, Archivio per la Zoolog., vol. 3. (sep.) p. 9, 1863. For *Xylota vagans* Wiedemann.

Syritta of Authors. Genotype, *Syritta vagans* (Wiedemann), Aussereur, zweifl. Ins., vol. 2, p. 101. *Planes vagans* (Wiedemann) Rondani, Archivio per la Zoolog., vol. 3, p. 9, 1863.

Syritta americana Schiner, Reise de Novara, Diptera, p. 367.—Williston, Trans. Amer. Ent. Soc., vol. 15, p. 285, 1888.

Syritta mexicana Bigot, Ann. Soc. France, 1883, p. 539.

The species belonging to this group, as far as known, are confined to Tropical America; whereas the species of *Xylota* and *Xylotomima* apparently are entirely of Nearctic distribution. The genus is clearly an intermediate group between *Xylotomima* (*Xylota*, in part) and *Syritta*.

Description.—General appearance similar to that of the Xylotae possessing yellow abdominal markings. Head broadly elliptical; front of female very narrow; ocellar triangle of male very narrow and elongate; ocelli well advanced of the occipital margin; antennae usually rather elongate; arista longer than width of face across middle; face subcarinate, slightly concave in profile; usually yellowish above anterior oral margin and well covered with silvery pollen; eyes very large, lower face, between side oral margin and eyes, narrow; body pile short and inconspicuous; metasternum unusually developed, pilose, the male sometimes with spur-like protuberances, hind margin truncate; hind femur remarkably thickened, keeled and spinose along lower surface; hind tibia at ventral apex produced into a usually long obtuse tooth; abdomen usually elongate and constricted at second and third segments; sternites extremely long and narrow; discal cross vein before or at middle of wing, fairly oblique; wing villosity normal.

The following key includes all the species known to the writer. In several cases one of the sexes is missing and this combined with the sexual dimorphism which occurs in the genus makes it advisable to key the sexes separately.

KEY TO SPECIES OF PLANES

A[1]. Males.
- B[1]. Metasternum with a pair of spurs.
  - C[1]. Second tergite largely yellow; third entirely black.
    - D[1]. Fourth tergite with dense, appressed, golden yellow pile (Mexico) ________________ pauxilla (Williston).
    - D[2]. Fourth tergite with normal whitish pile (Mexico). **willistoni**, new species.
  - C[2]. Second and third tergites each with a pair of yellow spots.
    - D[1]. Face greenish bronze (Cuba) ________________ pretiosa (Loew).
    - D[2]. Face black, anterior oral margin yellowish (Costa Rica). **rondanii**, new species.

B². Metasternum without spurs; tergites 2 and 3 with yellow spots.
C¹. Third tergite longer than the fourth (Costa Rica). schildi, new species.
C². Third tergite equal to the fourth.
D¹. Antennal prominence strongly developed; face decidedly retreating (Brazil) ---------- vagans (Wiedemann).
D². Antennal prominence less developed; face less retreating (Bolivia) ---------- boliviensis, new species.

A². Females.
B¹. Front and mid tibiae, except the whitish base, fuscous black (Cuba). pachymera (Loew).
B². Front and mid tibia whitish to yellow brown.
C¹. Width of front at vertex equal to length of third antennal joint (Bolivia) ---------- boliviensis, new species.
C². Width of front at vertex much less than length of third antennal joint.
D¹. Length of posterior cross vein much longer than distance between tips of second and third veins ---- vagans (Wiedemann).
D². Posterior cross vein equal to distance between second and third veins.
E¹. Length of front two and a half times the length of arista (Costa Rica) ---------- schildi, new species.
E². Length of front less than twice the length of arista (Bolivia) ---------- minor, new species.

PLANES PACHYMERA (Loew)

Xylota pachymera Loew, Cent. VI, 54.

Only the type, a female, is known. Notes based on type specimen. Face keeled; front rather narrow, a broad pollinose band below middle; vertex swollen; ocelli well advanced; arista as long as distance between ocelli and antennal base and nearly three times as broad as distance across antennal base; third joint more than twice as long as broad; face pollinose; body pile very short and pale; fore legs short, tarsi shorter than tibia; basitarsus without spines on basal ventral surfaces. Recorded from Cuba.

Type.—In Museum of Comparative Zoölogy.

PLANES PRETIOSA (Loew)

Xylota pretiosa Loew, Wien. Ent. Monat-schr., vol. 1, p. 39.

Only the male is known (said to be female, Williston). Ocelli well in advance of occipital margin; frontal triangle shining green, bordered with pollen and clothed with very fine pile; face pollinose except for greenish jowls; metasternum pilose and with a pair of spur-like processes. Recorded from Cuba.

Type.—Museum of Comparative Zoölogy.

PLANES PAUXILLA (Williston)

Xylota pauxilla Williston, Biol. Cent. Amer., Diptera, vol. 3, p. 71, 1903.

Notes based on the type. Face rather indistinctly carinate; antenna rather long; metasternum of male with a pair of spurs; abdo-

men moderately constricted basally, the apex with dense, appressed golden yellow pile. Recorded from Mexico.

Type.—In British Museum.

PLANES WILLISTONI, new species

Male.—Antenna blackish, reaching nearly to oral margin; third joint fairly broad; arista yellow, slightly longer than antenna; lower part of face in front yellowish; legs black, the bases and apices of tibiae and first three tarsal joints of all tarsi yellow, hind basitarsus brownish; hind fermur greatly swollen; hind tibia arcuate; metasternum pilose and with pair of rudimentary spurs; abdomen elongate, constricted at second and base of third segments; second tergite largely yellow; apex of abdomen with normal pale pile. Length, 12 mm.

Type locality.—Sierra Madre, Chih., Mexico, about 7,300 feet altitude, flowers of *Rhus glabra* (C. H. T. Townsend).

Type.—Cat. No. 28675, U.S.N.M.

Differs from *pauxilla* chiefly in the broader third antennal joint and lack of dense yellow pile on fourth tergite.

PLANES RONDANII, new species

Male.—A much larger species than *vagans.* Head large, broader than thorax; ocellar triangle more than three times as broad as its greatest width, ocelli midway; antennae black, reaching to oral margin; arista brownish; face black except yellowish above anterior oral margin; femora black; tibia yellowish basally, brownish beyond; two basal joints of fore and mid tarsi yellowish, remaining joints and hind tarsi brown; metasternum with obtuse spurs; abdomen elongate, constricted medianly; the second and third tergites each with a pair of small yellowish spots; discal cross vein slightly before middle of discal cell, fairly oblique, wings smoky. Length 13 mm., wing 9 mm.

Type locality.—Higuito, San Meteo, Costa Rica (Pablo Schild).

Type.—Cat. No. 27740, U.S.N.M.

PLANES VAGANS (Wiedemann)

Syritta americana Schiner?
Syritta mexicana Bigot?

Male.—Fairly large species; ocellar triangle very narrow and elongate; frontal triangle shining bluish-black, bordered with silvery pollinosity; antennal prominence well developed and projecting; antennae brownish; fairly elongate, third joint nearly twice as long as wide; face yellowish white, densely coated with silvery pollen; jowls blackish; yellowish pollinose mesonotal stripes rather indistinct; fore and mid tibiae yellowish; two basal joints of fore

and mid tarsi yellowish; hind legs blackish except for yellowish base of tibiae; second and third tergites each with a pair of yellowish spots; third and fourth tergites of equal length; metasternum pilose without spurs; wings subhyaline.

Female.—Front very long and narrow, width at vertex distinctly less than length of third antennal joint; abdomen somewhat broader and shorter than in the male. Length 12 mm.; wing 8.5 mm.

Originally described from Brazil. Specimens at hand: Para, Brazil (H. W. Bates); Ega, Brazil (H. W. Bates); Taboga Island, Panama, February 22, 1912 (A. Busck); Trinidad River, March 29, 1912 (A. Busck); Cano Saddle, Gatun Lake, August, 1923 (R. C. Shannon). The specimens from Panama have a somewhat different appearance from that of the Brazilian specimens but this is not sufficient for specific differentiation.

Sufficient data is not at hand to determine whether *S. americana* Schiner (= *mexicana* Bigot) is a synonym of *vagans* Wiedemann or the species described below, *schildi.*

Type.—Location unknown.

PLANES SCHILDI, new species

Male.—Rather small, slender species; ocelli well advanced of occipital margin; ocellar triangle elongate; antennal prominence moderatey developed; face blackish, becoming yellowish in front of oral margin, entirely covered with silvery pollen; mesonotal pollinose stripes fairly developed; fore and mid tibiae yellowish; fore and mid tarsi, except terminal three joints, yellowish white; metasternum without spurs; abdomen rather slender, tergites 2 and 3 with small yellow spots; fourth tergite shorter than the third.

Female.—Front very narrow, much less than length of third antennal joint and two and one-half times longer than the arista; front and mid tibia yellowish. Length, 7.5 mm.; wing, 6.5 mm.

Type locality.—Higuito, San Mateo, Costa Rica (Pablo Schild.)

Type.—Cat. No. 28674, U.S.N.M.

Male type, female allotype, male paratype. A very closely allied species to *vagans.*

Genus XYLOTOMIMA, new genus

Type.—*Xylota vecors* Osten Sacken.

Metasternum with pile approximately the length of the pile on hind coxa (sparse in *pigra*); head broadly elliptical; metathoracic spiracle approximately the size of second antennal joint; arista usually shorter than width of face; hind femur greatly enlarged; male with frontal triangle almost entirely shining (pollinose in *baton*

and *nemorum*); hind trochanter of male without spur (rudimentary in *metallica*); ventral surface of basitarsus with short black basal spines (except *metallica*). Front of male usually broad.

KEY TO SPECIES OF XYLOTOMIMA

(Metasternum pilose. Type, *Xylota vecors* Osten Sacken)

A¹. Legs entirely black.
  B¹. Wholly black species ---------- chalybea (Wiedemann).
  B². Abdomen chiefly red ---------- pigra (Fabricius).
A². Legs partly yellowish.
  B¹. Abdomen chiefly purplish red ---------- libo (Walker).
  B². Abdomen black, with or without yellow spots.
    C¹. Abdomen shining black; legs chiefly orange.
      D¹. Coxae black.
        E¹. Halteres black; transverse depression on fourth tergite occurs at the middle ---------- plesia (Curran).
        E². Halteres yellow; depression on fourth tergite at basal third ---------- curvipes, variety satanica (Bigot).
      D². Coxae yellow ---------- vecors (Osten Sacken).
    C². Abdomen not entirely shining black, usually with yellow spots and legs chiefly black.
      D¹. Hind femur yellow at base; fore legs yellowish brown.
        metallica (Wiedemann).
      D². Hind femur black at base; fore legs largely black.
        E¹. Face partly yellow ---------- anthreas (Walker).
        E². Face black.
          F¹. Arista yellow at base (eastern) ---------- baton (Walker).
          F². Arista entirely dark (western).
            G¹. Ocellar and mesonotal pile blackish; abdominal spots yellow (occasionally dark in female).
              nemorum, variety americana, new variety.
            G². Ocellar and mesonotal pile chiefly pale; abdominal spots dark aeneous ---------- dubia, new species.

XYLOTOMIMA CHALYBEA (Wiedemann)

Xylota purpurea WALKER. (In British Museum.)

The black coloration of the entire insect is so characteristic of this species that further description is unnecessary. The specimen upon which Walker based his species lacks the head and the country of its origin is unknown. However, what remains of it bears such a close resemblance to *chalybea* that it may well be assigned as a synonym of this species. Metcalf has figured the male genitalia.

Distribution.—A fairly common species in the eastern part of North America. Recorded from Kansas (Crevecoeur). Not recorded south of North Carolina.

Type.—Location unknown.

XYLOTOMIMA PIGRA (Fabricius)

Xylota rubiginigaster BIGOT. (Type examined. In British Museum.)

Fairly large and slender species about 12 mm. Everywhere blackish except abdomen beyond first tergite. Antennae rather small;

arista shorter than width of face; legs sometimes brownish, never yellow; pile on metasternum sparse; abdomen with first tergite black; anterior border of second with black median triangular projection, remainder of abdomen red; metathoracic spiracle unusually small, smaller than second antennal joint. Greene has figured the puparium.

Distribution.—A common species in Europe and North America, sometimes occurring in immense numbers.

Type.—Location unknown.

XYLOTOMIMA LIBO (Walker)

Xylota libo WALKER.
Xylota marginalis WILLISTON. (In U. S. Nat. Mus.)
Xylota libo Walker, JOHNSON, List of New England Diptera, 1925.

Fairly large and robust species 10–13 mm. Mesonotum dark brassy; abdomen purplish red; metasternum pilose; metathoracic spiracle about the size of second antennal joint. A rather rare species of northern and eastern North America.

Distribution.—Originally described from Nova Scotia (Walker). Recorded from New Hampshire (Williston); Axton, New York (Macgillivray and Houghton); Chapel Pond, Essex County, New York, June 28, 1923 (M. D. Leonard); Duncun, British Columbia (Osburn); Cincinnati, Ohio (Metcalf); North Carolina (Metcalf); Maryland and Virginia (Banks, Greene, McAtee, Shannon).

XYLOTOMIMA CURVIPES, variety SATANICA (Bigot)

Xylota curvipes LOEW, of authors.
Xylota satanica BIGOT. (Type in British Museum.)

Professor Hervé-Bazin has suggested to me the possibility that the American form going under the name of *curvipes* Loew is a different species from the European *curvipes* and gave me a specimen for comparison. This specimen, a female, differs from the American form in having the fore and mid trochanters black (reddish yellow in American female specimens) and the apex of the hind femur two-fifths black, one-fourth black in American specimens. The front is also slightly wider. A comparison of the male genitalia may prove the American form to be a distinct species. Meanwhile it is tentatively called a variety.

Male.—Frontal triangle shining black, silvery pollinose on sides; antennae brownish red, first joint darkest; arista brownish, a little longer than width of face; coxae black, remainder of four fore legs reddish yellow; hind legs black except basal three-fourths of femur which is reddish yellow; halteres yellow. Cerci unusually large and apparently inflated; styles fairly stout, straight; basal lobe nearly separated from rest of style by a deep narrow cleft; beyond cleft the

style is expanded into a rather obtuse tooth and following the tooth the style is constricted and partly twisted; apex obtusely pointed.

Female.—Front fairly narrow, but little narrowed above; fifth tergite sharply flattened on posterior corners.

Distribution.—Specimens at hand from White Mountains, New Hampshire (Williston collection); Vermont (H. A. Cutting); Keene Valley, Adirondacks, New York. June 24, 1920 (H. Notman); Wilmington Notch, Adirondacks, New York, June 29, 1922 (J. M. Aldrich); Colorado, 9,000 feet altitude. Apparently confined to northern latitudes or high altitudes farther south.

XYLOTOMIMA PLESIA (Curran)

Xylota plesia Curran, Can. Ent., vol. 57, 1925, p. 44.

Male.—Differs from *curvipes* Loew in being much smaller, 11 mm.; face narrower, more shining black; black spines at apex of mid tibia and on underside of mid tarsi (red and fewer in *curvipes*, var. *satanica*); the transverse swelling of the fourth tergite occurring at the middle (at basal third in *curvipes*, var. *satanica*); halteres darkened; cerci much smaller and flat, black in color (yellowish brown in *curvipes*, var. *satanica*); styles bowed; a deep and very broad cleft between basal lobe and remainder of style, the style beyond basal lobe simple in outline, narrowed basally, broadening apically and with obtuse point.

Distribution.—New York; Whiteface Mountain, Adirondacks, July 7, 1922 (J. M. Aldrich). Recorded by Curran from Bathhurst, New Brunswick; Meganic, Quebec; Hastings, Ontario.

Type.—In Canadian National collection.

XYLOTOMIMA VECORS (Osten Sacken)

Arista brownish, shorter than width of face; all parts of legs reddish yellow except black apex of hind femora and beyond; halteres darkened; fourth tergite of male swollen on basal third, and immediately following depression is another swollen area; fifth tergite of female not flattened on posterior corners. Male with moderate, unmodified cerci; no cleft between basal lobe and rest of style, styles beyond the lobes flattened, their inner edges opposed and together they form a somewhat hollow saucer-shaped structure. Metcalf [4] figures male genitalia. Specimens at hand show the same range of distribution as *curvipes*, apparently a mountain-loving species.

Distribution.—Recorded from Ottawa, Ontario, New England, New York, North Carolina, Minnesota, Colorado, Saskatchewan. Specimens at hand also from Pullman, Washington (V. Argo).

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[4] Ann. Ent. Soc. Amer., vol. 14, 1921, pl. 17, fig. 104.

(*Xylota*) *Xylotomina femorata* (Linnaeus) (European) has genitalia very similar to *vecors*. However it has a black coxae as in *curvipes*.

Type.—In Museum of Comparative Zoölogy.

XYLOTOMIMA METALLICA (Wiedemann)

Xylota subtropica CURRAN, Can. Ent., vol. 57, p. 44, 1925. In Canadian National Collection.

This species has rarely been recorded since it was described. Banks lists it in the "District of Columbia Diptera: Syrphidae" and states, "In general resembles *X. ejuncida*, but the pale femora will separate it." A number of specimens have been found in collections, by the writer, usually confused with *ejuncida*. The description is based upon these specimens.

A rather small, slender species, 10 mm.

Male.—Frontal triangle shining except along the margins, which are silvery pollinose; upper part of triangle with rather numerous hairs; arista yellowish brown; four fore legs reddish yellow, femora sometimes brownish through the middle, tips of tarsi darkened; hind legs mostly black, bases of femur and tibia and ventral surface of tarsus yellowish; hind trochanters with a trace of a spur; second and third tergites with large yellow spots; discal cross vein joining discal cell slightly before the middle; posterior cross vein shorter than section of fourth vein above it; metathoracic spiracle noticeably smaller than third antennal joint.

Female.—Arista about two and one-half times width of front across ocelli. Abdominal spots more obscured, sometimes quite small.

Originally described from Georgia.

Curran states in his description of *subtropica* that "this species is smaller and much more slender than *metallica* and has the oral margin decidedly less produced." His description was based on two males, from Memphis, Tennessee, in the Canadian National Collection. These characteristics are covered by material of *metallica* at hand and apparently are not sufficient for specific differentiation.

Distribution.—Georgia, Type locality (recorded by Wiedemann); Maryland: Bladensburg, September 23 (R. C. Shannon), Plummer Island, September 17 (R. C. Shannon); Virginia: Great Falls (McAtee), Dead Run, reared from rotten maple log, June 29, 1915 (R. C. Shannon), Falls Church, June 7 (N. Banks); Tennessee: Memphis, June 12, 1922 (Recorded by Curran); Florida: Jacksonville (Mrs. A. T. Slosson); Texas: Paris, April 4, 1904 (C. T. Brues).

Type.—Location unknown.

XYLOTOMIMA ANTHREAS (Walker)

Xylota fasialis Coquillett, Proc. Ent. Soc. Wash., vol. 12, p. 126. (In U. S. National Museum.)

A fairly large and robust species, 12 mm.

Male.—Frontal triangle silvery pollinose; arista shorter than width of face; face partly yellow; anterior basitarsus without long apical hair but with basal ventral spines; metasternum pilose; hind trochanter without spur; hind legs entirely black except base of tibia; second and third tergites opaque black with large subquadrate black spots; fourth tergite shining bronze green; discal cross vein joining discal cell at middle; metathoracic spiracle a little smaller than third antennal joint.

Female.—Ocelli placed well back; front rather broad, across ocelli about one-half the length of arista.

The female has not been previously recorded.

The specimen which bears the type and name label "*Xylota anthreas* Walker" in the British Museum is in good condition except for some slight discoloration. The principal characters in Walker's description call for: Body brassy; antennae brown; arista black; mouth black; sides of abdominal segments adorned with large steel blue spots; legs bronze black; tibia yellow at base; four fore tibiae piceous, tawny at base and tips; tarsi tawny. Length about 9 mm., wing about 4.5 mm.

The type specimen does not agree with Walker's description in two important respects. The face is partly yellow and the abdominal spots are yellow instead of being steel blue. The possession of these two characteristics correlated with certain other characters, definitely prove it to be the same species as *Xylota fascialis* Coquillet.

It seems quite certain that Walker had this specimen before him at the time he described *anthreas* as the description he gives for *anthreas* does not fit any other North American species and nowhere else in his publications does he give a description in which the essential characters of *anthreas* are mentioned.

Distribution.—Michigan, Pequaming, July 12, 1903, male, type (M. Hebard); Maine, (C. W. Johnson); New York: Ithaca, June, 1922, female (R. C. Shannon), Mount Skylight, Adirondacks, 4,900 feet, July 22, 1920, male (J. Bequaert collection); Maryland, Beltsville, June 25, 1915, male (R. C. Shannon); Virginia, Dead Run, Fairfax County, May 19, 1916, female (R. C. Shannon).

Type.—In British Museum.

XYLOTOMIMA BATON (Walker)

Xylota baton Walker, List 3, 1849, p. 554.
Xylota fraudulosa Loew, (Museum of Comparative Zoölogy).

For many years this species has been standing as a synonym of *ejuncida* Say. An examination of the type shows that the metasternum is pilose (pubescent in *ejuncida*) and other characters show it to be conspecific with *fraudulosa.*

One of our most common species in eastern North America. Apparently this species is very closely related to the European *nemorum* Fabricius, differing chiefly in the more yellowish antennae and yellow base of arista.

A small rather robust species, 8–9 mm.

Male.—Frontal triangle silvery pollinose; arista yellowish at base, darker beyond, shorter than width of face; femora black except extreme apices; hind tibia black except base; hind tarsi black dorsally, yellowish ventrally; second and third tergites with quadrate spots; postthoracic spiracle smaller than third antennal joint.

Female.—Front fairly broad, arista a little more than twice width of front across ocelli; abdominal spots small, sometimes obsolete.

Distribution.—Has been reported (under the name *fraudulosa*) from nearly all parts of the United States except Arizona. The western records probably should be applied to *nemorum americana.*

Type.—In British Museum.

XYLOTOMIMA NEMORUM (Fabricius)

Xylota dascon Walker. (In British Museum).

It is uncertain whether typical *nemorum* occurs in America. Until this can be ascertained the writer proposes calling our closest allied form a variety of *nemorum.* The specimen described by Walker as *dascon* appears to be a synonym of *nemorum.* Country unknown.

Type.—Location unknown.

XYLOTOMIMA NEMORUM AMERICANA, new variety

This form differs from *baton* by having the arista dark brown throughout or yellowish brown at base and gradually merging into darker color beyond; and in the male the basal lobe of the style is smaller.

The two forms are very closely allied but according to the material at hand *baton* is a species of the Eastern United States while *nemorum americana* is of western distribution. The latter differs from European *nemorum* chiefly in having the mesonotal pile black whereas it is pale in typical *nemorum.*

X. nigromaculata Jones may prove to be a dark-bodied variety of this species. (Type, in University of Nebraska).

X. nemorum has been recorded from Montreal, California, Oregon, New Hampshire and Massachusetts.

Type locality.—Walnut Creek, California.

Type.—Cat. No. 27317, U.S.N.M.

Holotype male; allotype female; five paratypes.

Distribution.—California, Walnut Creek, April (W. M. Davidson); Sausalito, July 13 (J. C. Thompson); Washington, Seattle; Colorado, Locality? 7,800 feet; British Columbia, Kaslo, June 15 (R. P. Currie).

XYLOTOMIMA DUBIA, new species

Male—Head broadly subtriangular; ocellar triangle rather broad, fore ocellus farthest removed; ocellar triangle clothed with fairly long, sparse, pale pile; frontal triangle and face heavily coated with white pollen; antennae yellowish brown; third joint subquadrate; arista shorter than width of face; mesonotum dark aeneous with four obscure stripes, clothed with short pale pile, darker posteriorly and longer, sparse black hairs; metasternum pilose; hind femur enlarged, spinose on its entire lower surface; second tergite with opaque anterior and posterior margins connected by a median opaque band, with a pair of large quadrate dark aeneous spots which extend over the sides; third tergite similarly marked but the aeneous spots border onto the anterior margin; fourth entirely dark aeneous; basal lobes of styles large, the styles small, rounded, about the size of the cerci; wings nearly hyaline; discal cross vein joining discal cell a little beyond middle; squamae white; halteres yellow; metathoracic spiracle distinctly smaller than third antennal joint. Length, 9 mm.; wing, 7 mm.

A female specimen, North Westminster, British Columbia, determined by Coquillett as *X. metallifera* Bigot is closely related if not the same. It has a broader than long third antennal joint and the fourth tergite is opaque black on front and hind margin with a slight opaque band extending between.

Type locality.—Juliaetta, Idaho.

Type.—Cat. No. 27318, U.S.N.M.

Distribution.—Idaho; Juliaetta (J. M. Aldrich).

XYLOTODES, new genus

Type.—*Brachypalpus inarmatus* Hunter.

Metasternum pilose; head triangular; metathoracic spiracle distinctly smaller than third antennal joint; arista much shorter than width of face at middle; third antennal joint broader than long; face, below eye, broader than length of third antennal joint; hind

trochanters unspurred; hind femur, both sexes, enlarged, without protuberances, irregularly spinose beneath; frontal triangle of male densely silvery pollinose; front of female broad; abdomen with more or less well developed opaque markings.

The genus *Xylotodes* is hardly separable from *Xylotomima*. The shape of the head offers a better means of separating them than the pilosity; also the width of the lower face (jowl) between the lower margin of the eye and the side oral margin is broader in *Xylotodes* than in *Xylotomima*.

KEY TO SPECIES OF XYLOTODES

(*Brachypalpus*, in part)

A[1]. Pile very short and inconspicuous; wings without definite clouding. brevipilosus, new species.

A[2]. Pile fairly long and conspicuous; wings with discal crossvein clouded.

B[1]. Fourth tergite entirely blackish.

C[1]. Third tergite shining bluish black ____ pigra (Lovett).

C[2]. Third tergite bluish black on anterior half, subopaque posteriorly.

D[1]. Third antennal joint distinctly broader than long; ocellar pile and tarsi black ____ metallifera (Bigot).

D[2]. Third antennal joint about as long as broad.

E[1]. Ocellar pile grayish; tarsi brownish; arista yellowish; wings clouded on crossveins ____ parvus (Williston).

E[2]. Ocellar pile and legs black; arista black; all wing veins clouded ____ sacawajeae, new species.

B[2]. Fourth tergite with bright yellowish hind margin.

inarmatus (Hunter).

inarmatus apicaudus (Curran).

XYLOTODES BREVIPILOSUS, new species

Female.—Medium size, dark species with very short pile. Head triangular; front rather broad; ocelli placed well backward; front dark brassy, a pollinose band across middle; first two antennal joints longer than third, black; third joint broader than long, brownish; arista 1.5 times length of antenna but much shorter than width of face, dark brown; face covered with grayish pollen; face between oral margin and eye much broader than width of third antennal joint; mesonotum dark aeneous, pollinose anteriorly with semblance of two median stripes which quickly fade into very dark non-pollinose stripes; pile very short; legs black with bases of all tibiae yellowish, anterior tarsi somewhat brownish; metasternum pilose; hind femur moderately swollen, spinose posteriorly on lower side; abdomen dark aeneous, subopaque medianly and posteriorly on second and third tergites; wings diffusely clouded; squamae white; plumula and halteres pale yellow. Length 9.5 mm., wing 7.5 mm.

Type locality.—Blue Mountains, Washington, June, 1924 (V. Argo).

Type.—Cat. No. 27742, U.S.N.M.

XYLOTODES INARMATUS (Hunter)

Four males at hand; the female, as yet, unrecorded. Idaho, Maine, Ontario.

Type.—In University of Nebraska.

XYLOTODES INARMATUS APICAUDUS (Curran)

Brachypalpus apicaudus CURRAN, Can. Ent., vol. 54, 1922, p. 119.

According to description, the only difference this form possesses that is not overlapped by the material of *inarmatus* at hand, is the absence of a distinct opaque spot on the second tergite which is present in *inarmatus.* Described from Cranbrook, British Columbia.

Type.—In Canadian National collection.

XYLOTODES PIGRA (Lovett)

Brachypalpus pigra LOVETT, Proc. Cal. Acad. Sci., vol. 9, 1919, p. 241.

A species well characterized by its dark aeneous mesonotum, with four subopaque black vittae; shining black abdomen, the first and basal half of second segments aeneous; legs with yellowish knees; wings with a cloud across the forks of the veins and on discal cell. Previously known only from a single female, recorded from Mount Jefferson, Oregon (Lovett). V. Agro took this species, both sexes, in the Blue Mountains, Washington, June, 1924. Walla Walla, April 12, 1924, and Pullman, April–May, 1923.

Type.—In University of Oregon.

XYLOTODES METALLIFERA (Bigot)

Xylota metallifera BIGOT.
Brachypalpus rileyi WILLISTON.

An early spring species, usually found resting on logs. Has been reared from debris at base of a cedar stump. The pupa has been figured by Greene. Originally recorded from Colorado, but has not been reported from there since. Other records from Quebec, New York, Virginia, North Carolina, and Ohio.

Type.—In British Museum.

XYLOTODES PARVUS (Williston)

The type specimen appears to be an unusually small specimen, 8.5 mm. Other specimens are 10–11 mm. Occurs in Colorado, Oregon, Idaho (Kendrick, J. M. Aldrich); British Columbia.

Type.—In U. S. National Museum.

XYLOTODES SACAJAWEAI, new species

Male.—A small, dark species with wing veins extensively clouded. Head distinctly triangular; occiput with pale pile; ocellar triangle with black pile; eyes barely separated; ocellar triangle black, lightly dusted with whitish pollen; antennae small, third joint a trifle longer

than broad; arista scarcely longer than length of antenna; third joint and arista dark brown; face black, lightly dusted in front, well produced downwards, broader between lower eye margin and oral margin than length of arista; thorax aeneous, with a pair of inconspicuous subopaque dorsal vittae and a pair of sublateral vittae which are distinctly broader; legs black, the knees dark brown; abdomen shining dark aeneous, the second and third tergites with opaque black posterior bands which have a median forward extension; wing veins extensively clouded. Length 8.5 mm., wing 7.5 mm.

Distinguished from *parvus* by its darker color and wing clouding.

Type locality.—Pullman, Washington, April, 1924 (V. Argo).

Type.—Cat. No. 27316, U.S.N.M.

Genus BRACHYPALPUS Macquart

Genotype.—Brachypalpus valgus (Panzer).

Metasternum faintly pubescent; head distinctly triangular; metathoracic spiracle distinctly smaller than third antennal joint; arista much shorter than width of face at middle; hind femur swollen in both sexes, and with a very obtuse and apical protuberance on inner, ventral surface; hind trochanters of male spurred; hind tibia, except in female *oarus*, with subbasal projection; frontal triangle of male covered with silvery pollen; front of female broad, about twice as broad as in genus *Xylota;* abdomen black, opaque markings very weak.

With the exclusion of all the American species, with the exception of *B. oarus* (*frontosus*) which have been hitherto placed in this genus, *Brachypalpus* remains a well-characterized genus.

BRACHYPALPUS OARUS (Walker)

Xylota oarus Walker, List 3, 1849, p. 558.

Brachypalpus frontosus Loew. (In Museum of Comparative Zoology).

This, our only species in *Brachypalpus*, agrees remarkably well with the genotype *valgus* (Panzer), in possessing a number of well-defined generic characteristics noted above. It is a fairly common early spring species. Larvae live in decaying trees and logs. Larva and pupa have been described by Malloch.[5] Eastern North America.

Type.—In British Museum.

AMERICAN SPECIES HEREIN TRANSFERRED FROM BRACHYPALPUS TO OTHER GENERA

Brachypalpus apicaudus Curran=*Xylotodes inarmatus apicaudus* (Curran).

Brachypalpus inarmatus Hunter=*Xylotodes inarmatus* (Hunter).

Brachypalpus metallifera (Bigot)=*Xylotodes metallifera* (Bigot).

Brachypalpus parvus Williston=*Xylotodes parvus* (Williston).

Brachypalpus pigra Lovett=*Xylotodes pigra* (Lovett).

Milesia amithaon Walker=*?Brachypalpus* (Osten Sacken)=*?Criopora* (Williston).=*Criopora amithaon* (Walker).

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[5] Bull. Ill. St. Lab., p. 343, 1915.

Genus XYLOTA Meigen, sensu stricto

The Xylotae proper, represented by the genotype *Xylota segnis* (Linnaeus), are characterized by: Metasternum with faint pubescence which is very much shorter than the length of the pile on hind coxae; head broadly elliptical; metathoracic spiracle as large or larger than third antennal joint; arista usually longer than width of face at middle; hind femora usually fairly slender; male with frontal triangle covered with silvery pollinosity (except *viridaenea*); hind trochanter with spur (except *bicolor*); fore basitarsus with a long light-colored hair on inner apical corner; ventral surface with short black spines near base. Female: Front rather narrow.

In the following key *scutellarmata* Lovett has been omitted.

KEY TO THE SPECIES OF XYLOTA, SENSU STRICTO

(Metasternum faintly pubescent; type, *Xylota segnis* (Linnaeus))

A¹. Arista pubescent; antenna black; second and third tergites chiefly reddish or yellowish brown.
B¹. Second and third tergites with median dark line_____**subfasciata** Loew.
B². Second and third tergites without median line________**notha** Williston.
A². Arista bare.
B¹. Abdomen largely purplish red; legs entirely reddish brown.
rufipes Williston.
B². Abdomen not purplish red.
C¹. Abdomen chiefly reddish orange beyond first tergite, rarely darkened apically (see *segnis*).
D¹. Hind tibia entirely black; arista longer than width of face; abdominal pile entirely white and yellow; male without spur (eastern species)______________________________**bicolor** Loew.
D². Hind tibia yellow at base; arista about as long as width of face; male with spur, always? (western species).
E¹. Hind tarsi mostly bright yellow____________**flavitibia** Bigot.
E². Hind tarsi entirely black________________**argoi**, new species.
C². Abdomen black, second and third tergites may have more or less reddish or yellowish color.
D¹. Second and third tergites brassy red; mesonotum green aeneous; ocelli placed well forward of occipital margin of eyes.
segnis (Linnaeus).
D². Second and third tergites not brassy red, but with or without yellowish spots.
E¹. Abdomen with fourth tergite bright metallic green; second tergite with pair of brassy yellow spots.
F¹. Arista shorter than width of face______**analis** Williston.
F². Arista longer than width of face.
G¹. Face yellow; antennae black; third tergite without yellow spots____________________**nebulosa** Johnson.
G². Face black; antennae yellow; third tergite with yellow spots________________**viridaenea**, new species.

E². Abdomen with fourth tergite dark metallic green and without yellow spots on second tergite, or fourth tergite black and yellow spots present or absent on second tergite.

F¹. Upper pleural pile coarse and black; second tergite without, third with, yellow spots; arista a little longer than width of face ---------- **naknek** Hine.

G¹. Third antennal joint as long as broad **naknek naknek**, sensu stricto.

G² Third antennal joint longer than broad **naknek atlantica**, new variety.

F². Pleural pile entirely pale.

G¹. Arista shorter than width of face.

H¹. Second tergite with yellow spots.

I¹. Arista yellowish ---------- **rainieri**, new species.

I². Arista black ---------- **confusa**, new species.

H². Abdomen without yellow spots; face less than twice the width of third joint - **flavifrons** Walker.

G². Arista longer than width of face.

H¹. Second and third tergites both with decided yellow markings.

I¹. Face more or less yellowish; apical cross vein joining third vein acutely; robust species (*bivittata* Lovett) ---------- **lovetti** Curran.

I². Face black; distal portion of apical cross vein forming right angle with third vein.

J¹. Rather slender species; male with distinct spur on trochanter ---------- **ejuncida** Say.

J². Robust species; male with spur barely suggested (Mexico) **brachygaster** Williston.

H². Either the second or third tergites without yellow spots, or both.

I¹. Metathoracic spiracle distinctly larger than third antennal joint; robust species (western) ---------- **barbata** Loew.

I². Metathoracic spiracle not larger than third antennal joint; rather slender species.

J¹. Abdomen steel blue, hind margins of tergites two and three opaque (Mexico) **stenogaster** Williston.

J². Abdomen not steel-blue.

K¹. Fourth tergite longer than broad; third antennal joint of female much longer than width of lower, side face. **angustiventris** Loew.

K². Fourth tergite broader than long; third joint slightly longer than width of lower face. **ejuncida**, variety **elongata** Williston.

XYLOTA SEGNIS (Linnaeus)

Xylota segnis Linnaeus, genotype of *Xylota*, and a well-known species in Europe, was first recorded from North America in 1915. In Aldrich's card index is a note: "A male specimen, agreeing exactly with Verrall, was sent me by Arthur Gibson for identification; locality, MacNabs Island, N. S." This is followed by "Gibson, Record, 1915, occurring in Halifax, N. S. Same specimen as preceding."

Description based on European material: Rather large and fairly slender species, 10–13 mm. Antennae black; third joint rounded; arista black, longer than width of face; mesonotum distinctly brassy; fore basitarsal joint of male with long light hair at apical inner corner and black spines on under side near base; mid basitarsus with black spines only at apex; metasternum pubescent; hind trochanters of male spurred; second and third tergites chiefly brassy red, remainder of abdomen black; wings hyaline; discal cross vein joining discal cell well beyond middle; posterior cross vein shorter than section of fourth vein above it; metathoracic spiracle slightly smaller than third antennal joint.

Distribution in America.—Nova Scotia, MacNabs Island, Halifax, 1915. (A. Gibson.)

Type.—In Linnaean Society, London.

XYLOTA SUBFASCIATA Loew

Xylota subfasciata Loew is closely related to *ejuncida* Say. The description was based on material from "Red River of the North, Canada," 1857. Since then it has rarely been correctly identified. In the National Collection there are three specimens (New Hampshire) of the Williston collection of Syrphidae which Williston determined as *Xylota ejuncida* Say. They differ from *ejuncida*, however, and as they agree perfectly with Loew's description of *subfasciata* and possess in common with Loew's type certain other characters recorded in the notes of the writer, they have been designated as this species. Other specimens from New England are at hand which are conspecific.

Medium sized, rather slender species, 9–11 mm. Antenna very dark brown to black, third joint slightly excavated on upper margin, a little longer than broad; arista black, longer than width of face, noticeably pubescent under a 27X hand lens or medium power of the binocular (a minute but good character for both sexes; the color of the abdomen heretofore used for specific diagnosis is too variable for exact specific purposes); mesonotum dark aeneous; last two fore tarsal joints black; anterior tarsus of male with a long hair on apex of first and second joints, black spines on lower side of basitarsus;

metasternum pubescent; hind trochanter of male with longer spur than *ejuncida;* discal crossvein joining discal cell beyond middle; second and third tergites chiefly reddish yellow, a dark narrow median line (more or less definite) extending down through the lighter color, and also present on the hind margins.

Distribution.—Maine, Bar Harbor, August 16, one male (C. W. Johnson); New Hampshire, Franconia, July 18, 1915, 1 male (C. H. T. Townsend, White Mountains, 2 females, 1 male (Williston collection)); Alaska, Fairbanks, July 7, 1924 (J. M. Aldrich), Anchorage, June 13, 1924 (J. M. Aldrich), Savonoski, Naknek Lake, July (J. S. Hine).

Xylota subfasciata Loew has been recorded (correctly so?) from Virginia, District of Columbia, Maryland, Wisconsin, and Oregon.

This species probably will prove to be of northern distribution. Metcalf figures the male genitalia and Cole and Lovett state that it has been reared from the decayed heart of fir.

Type.—In Museum of Comparative Zoölogy.

XYLOTA NOTHA Williston

Very closely related to *X. subfasciata* Loew. It differs in averaging a little larger, 10–12 mm.; mesonotum more brassy, and the second and third tergites entirely red except for anterior border of the second and posterior margin of the third. A female from New Mexico has the dark markings as in *subfasciata.* Male with well developed spur on hind trochanter, said by Williston to be absent.

Distribution.—Colorado, Locality? one male, type (Williston Collection). Locality?, 8,000 feet altitude, one male; New Mexico: White Mountains, North Fork Ruidoso, 8,200 feet, flowers of *Solidago trinervata*, 1 male (C. H. T. Townsend); Beulah, July 11, 1902, female (T. D. A. Cockerell); Chusca Mountains, 8,800 feet, June 30, 1918 (A. Wetmore, Biological Survey Collection).

This species has been recorded from Vineland, Ontario, Canada (A. Gibson). Perhaps it will be found to be confined chiefly to high altitudes in the southern Rocky Mountains.

Type.—In U. S. National Museum.

XYLOTA EJUNCIDA Say

A discussion of this and allied species has been given in the introduction.

Medium size, rather slender, 9–11 mm. Third antennal joint somewhat variable, a little longer than broad, rounded, yellowish to blackish in color; arista entirely black, bare, longer than width of face; mesonotum dark aeneous; last three tarsal joints of fore tarsi black; only basitarsal joint of fore tarsus with long hair; meta-

sternum pubescent; spur on hind trochanter of male small, pointed; hind femora but little thickened, regular in outline, spinose beneath on nearly entire length, more slender in female; discal cross vein joining discal cell beyond its middle. Some variation occurs in this species besides that noted under *ejuncida elongata.* Two males, Waldoboro, Maine, and Big Moose, New York, are somewhat more robust in appearance, have more black on the second and third tergites and only the last two tarsal joints of fore tarsus black. One male and female, Falls Church, Virginia, and Washington, District of Columbia, besides the differences noted above, have a yellow arista. Two females, Washington State, have brighter and more quadrate abdominal markings. A male, El Paso County, Colorado, agrees very closely to typical *ejuncida.* In some material sent by Mr. Johnson are a number of specimens from New England which are also more robust in appearance. One normally colored female and three of the *elongata* variety are amongst them. The latter may easily be mistaken according to original descriptions for *obscura* (=*flavifrons*) or *anthreas.*

Distribution.—Common throughout the eastern United States and Canada. Has been recorded from Alaska and a number of western States.

Type.—Lost.

XYLOTA EJUNCIDA, variety ELONGATA Williston

This variety is based on Williston's Pennsylvania specimen of *elongata*, which he later redetermined (but did not publish), as *anthreas* Walker. A full discussion is given in the introduction.

This variation is rather a rare one occuring apparently only in the female. It is characterized by having the yellow abdominal markings entirely obscured by bluish-black metallic coloration. A female of the type series of Loew's *quadrimaculata* (=*ejuncida*) has an entirely dark abdomen. Three specimens sent by Mr. Johnson and one from New York are rather large and robust, corresponding to the large males noted under *elongata.*

Distribution.—Pennsylvania: locality? (Williston); Perdix, May 27, 1911 (W. S. Fisher); New York, Wells, July 26, 1918 (D. B. Young); New Hampshire, White Mountains (Williston); Maine: Bar Harbor, June 6 (C. W. Johnson), Capens, July 7 (C. W. Johnson).

Type.—In U. S. National Museum.

XYLOTA CONFUSA, new species

Male.—Very similar to *Xylota ejuncida* in appearance. Differs chiefly in its somewhat larger ocellar triangle; less pollinose frontal triangle; short arista and broad face, arista being a little shorter

than width of face across middle; hind tarsi entirely blackish-brown; abdominal spots rather small and well defined; spur on hind trochanter distinctly smaller. Length 11 mm; wing 8.5 mm.

Type locality.—Princeton, Maine, July 12 (C. W. Johnson).

Type.—In collection Boston Society Natural History.

One male from North Westminster, British Columbia, June 3, 1909, except for its more elongate appearance, agrees fairly well with *confusa.*

XYLOTA SCUTELLARMATA Lovett

Xylota scutellarmata Lovett, Proc. Calif. Acad. Sci., vol. 9, p. 241, 1919.

The following description is taken from Lovett.

Female.—Length 8 mm. Shining black; thorax with short golden pile; margin of scutellum with four elongate black bristles; abdomen opaque black, tergites two and three, with small yellow triangular spots. Face short, moderately concave, brownish, lighter about the oral margin; antennae brownish; arista dark brown, twice as long as antenna. Legs brown, base of all and tips of middle and front tibiae and basal joints of tarsi of front and middle legs light yellow. Collected at Hood River, Oregon, June 6, 1917 (F. R. Cole). Near *nemorum;* varies in bristles of scutellum, etc.

According to the description, this species probably belongs to the subgenus *Xylota*, whereas *nemorum* is located in *Xylotomima.* Long marginal hairs of varying length occur on the scutellum in nearly all of the species of *Xylota.* Because of this it is difficult to estimate the value of marginal bristles as a specific character. However, there are in the collection a male and female (Colorado) which bear on the scutellar margin four unusually strong and dark bristles. These may be *scutellarmata* or a form closely allied. They are closely related to *ejuncida*, which has strong scutellar bristles, but these are yellowish in color. The male has the yellow spots obscured by bluish-black metallic spots.

Type.—In University of Oregon.

XYLOTA LOVETTI Curran

Xylota bivittata Lovett, Proc. Calif. Acad. Sci., vol. 10, p. 52, 1920. Name preoccupied by *Xylota bivittata* Bigot (Chile). This species, however, belongs to *Tropidia.*

Xylota lovetti Curran, Can. Ent., vol. 67, p. 44, 1925.

Xylota oregona Curran, Can. Ent., vol. 67, p. 44, 1925. (In Canadian National Collection.)

Male.—Fairly large, robust species, 11 mm. Antennae yellowish; arista black, longer than width of face; face yellowish to brownish; mesonotum dark aeneous; anterior basitarsus without long hair; metasternum pubescent; hind femur but little thickened; yellow spots on second and third tergites large, quadrate; discal cross vein

joining discal cell at its middle; apical cross vein joining third vein at an acute angle; metathoracic spiracle approximates the size of third antennal joint.

Female.—Not at hand. Described by Curran under the name *oregona.*

Distribution.—California: Huntington Lake, Fresno, July 21, 1919, type locality, one male (E. P. Van Duzee); Summerdale, July 1, 1906, one male (H. E. Burke); Oregon, Mount Jefferson, July 15, 1907, one male (J. C. Bridwell); Washington, Lake Cushman, Mason County, August 6, 1919 (F. M. Gaige; collection J. S. Hine).

Type.—In University of Oregon. (As *Xylota bivittata* Lovett.)

XYLOTA ANALIS Williston

Fairly large and robust species, 12–13 mm. Antennae brownish; third joint as broad as long; arista yellowish brown, shorter than width of face; frontal triangle of male bare and shining anteriorly, broadly pollinose posteriorly; front of female rather broad, its width across ocelli about half the length of arista, a rather broad pollinose band across middle; face partly yellowish brown; male without long hair on basitarsus; metasternum bare; hind trochanter of male with spur; second and third tergites with yellowish spots; fourth tergite bright greenish aeneous; discal cross vein joining discal cell beyond middle; posterior cross vein longer than section of fourth vein above it; post thoracic spiracle a little smaller than third antennal joint.

Records from the eastern United States may prove to belong to *Xylota viridaenea.*

California, New Mexico, Colorado. Has also been recorded from New Jersey, Florida, Ohio, Nebraska and British Columbia.

Distribution.—Washington, Lake Cushman, Mason County, June 29, 1919 (F. M. Gaige); California, Locality? Williston Collection); New Mexico, Locality? (Williston Collection); Mexico, Sierra Madre, 7,300 feet (C. H. T. Townsend); Colorado, Locality?

Type.—In U. S. National Museum.

XYLOTA NEBULOSA Johnson

Xylota nebulosa JOHNSON, Psyche, vol. 28, p. 58, 1921.

Medium sized, fairly slender species, 9 mm. Known only in the male. Frontal triangle covered with yellowish pubescence; face yellow, cheeks brown; mesonotum bronze black; second tergite only with yellow spots; fourth tergite bright metallic green with dense yellow tomentum; outer half of wing clouded.

Distribution.—Texas. Locality? One male.

Type.—In collection of C. W. Johnson, Boston, Mass.

XYLOTA VIRIDAENEA, new species

This species has probably been confused with *X. analis* Williston, which may account for some of the records of *analis* from the eastern United States.

Male.—Medium sized, fairly robust, 10.5 mm., wing 7.5 mm. Head broadly elliptical in frontal aspect; ocellar triangle shining black, with black pile; frontal triangle shining, pollinose only at vertex; antenna brownish yellow; third joint a little longer than broad; arista concolorous with antenna on basal third, darker beyond, a little longer than width of face; face greenish black; coated with white pollen; mesonotum greenish aeneous with short yellow pile, very few longer hairs present; scutellum rather large, rimmed, colored and clothed as mesonotum; pleurae darker in color, pollinose and with rather dense golden, coarse pile; femora dark except their apices; tibiae yellow, the posterior ones more brownish; tarsi yellow except last two joints in all cases; anterior basitarsus with black ventral basal spines and long yellow hair at dorsal apex, mid basitarsus with very few black spines on under side, more numerous apically; all pulvilli darkened; mestasternum pubescent; hind trochanters with spur; hind femora fairly large with equal spines along nearly the entire length of under side; first tergite aeneous; second and third with a pair of large brassy yellow spots on each which extend full width over the sides of abdomen; third tergite rather extensively black posteriorly; fourth tergite greenish aeneous with bright yellow pile on sides, black in middle; wings slightly smoky; third vein nearly straight; discal cross vein joining discal cell a little beyond middle; posterior cross vein noticeably shorter than section of fourth vein above it; squama with cilia and halteres yellowish; postthoracic spiracle a little smaller than third antennal joint.

Type.—Cat. No. 27312, U.S.N.M.

Holotype, male.

X. nebulosa Johnson differs from *viridaenea* by its yellow face, black antennae, a single pair of abdominal spots, fourth tergite with entirely yellow tomentum and clouding of wings.

X. analis Williston differs in having a shorter arista, more pollinose frontal triangle, gently curved third vein, and posterior cross vein longer than upper outer section of discal cell.

Distribution.—Georgia, Thomasville, one male (Mrs. A. P. Taylor).

XYLOTA NAKNEK Hine

Male.—Head broadly elliptical; frontal triangle pollinose, except anterior margin; ocelli placed nearly the length of their altitude before hind-eye margins; first two antennal joints black; third dark brown, slightly longer than broad; arista black, bare, a little longer

than width of face; mesonotum very dark aeneous, clothed with short, appressed, pale pile, with rather numerous and long black hairs intermixed chiefly posteriorly; scutellum as the mesonotum, the marginal hairs unusually long, black; upper posterior corner of mesopleura and upper pteropleura with coarse black hairs, remaining pleural pile white; fore basitarsus with long pale apical hair; group of black spines on ventral surface near base; femora black, four fore tibiae an tarsi brown; hind legs nearly entirely black, tips of tibia dark brown; femora moderately enlarged and with rudimentary apical process on inner ventral surface; second tergite with pair of shining aeneous spots; third with pair of yellow spots tinged with dark aeneous; first tergite with pale pile, remaining tergites with pale pile on anterior corners, black medianly and posteriorly; wings faintly smoky; discal cross vein joining discal cell little beyond middle; posterior cross vein subequal to upper outer section of discal cell; squamae white; halteres yellowish; length 9 mm.; wing 8 mm.

Type locality.—Naknek, Alaska (J. Hine); Anchorage, Alaska, June 16, 1921 (J. M. Aldrich).

Type.—In collection of J. S. Hine, Columbus, Ohio.

Holotype male; paratype male.

This species is related to the *ejuncida* group. The black mesonotal pile and black hairs on the pleurae and abdominal markings distinguish it.

XYLOTA NAKNEK ATLANTICA, new variety

Xylota hesperia atlantica SHANNON, nomen nudum, Fauna of New England, vol. 15, 1925, p. 176.

Two male specimens, Bar Harbor, Maine (C. W. Johnson), and Franconia, New Hampshire, agree with the specimens from Alaska in practically all details. They differ by having the third antennal joint longer than broad, while it is as broad as long in Alaskan specimens.

Type.—In collection Boston Society Natural History.

Paratype.—Cat. No. 27743, U.S.N.M.

XYLOTA RAINIERI, new species

Male.—Ocelli set nearly their altitude from hind-eye margin; frontal triangle pollinose except small anterior area; antennae yellowish brown, third joint subquadrate; arista somewhat lighter, distinctly shorter than width of face; mesonotum with dark blue and greenish reflections, pile mostly pale with sparse, rather long, black hairs intermixed posteriorly; pleurae with white and some yellowish pile; fore basitarsus without long pale hair at apex; ventral basal spines present; spur of average size; second tergite with fairly

large triangular spots, the apices obtuse and directed inwards; third with rather obscured yellowish spots; fourth tergite dark metallic green with mostly yellowish pile, black medianly and posteriorly; discal cross vein joining discal cell a little beyond middle; posterior cross vein a little longer than section of fourth vein above it; squamae white, faintly tinted with yellow; halteres yellow. Length 11.5 mm., wing 9.5 mm.

Type locality.—Mount Rainier, above Longmire's, 5,000 feet, Washington.

Type.—Cat. No. 27314, U.S.N.M.

Holotype male; paratype male.

This species is closest to *flavifrons*. Besides the presence of the yellow abdominal spots and difference in position of discal cross-vein it differs further by having the forceps in the male much less curved and stouter.

Distribution.—Washington, Mount Rainier, above Longmire's, 5,000 feet, August 3, 1905 (J. M. Aldrich).

XYLOTA FLAVIFRONS Walker

Xylota communis Walker. (In British Museum.)
Xylota obscura Loew. (In Museum of Comparative Zoölogy.)

Male.—Ocelli less than their altitude from hind-eye margins; frontal triangle pollinose, except anterior margin; antennae brown, third joint more yellowish, as broad as long, rounded apically; arista dark brown, distinctly shorter than width of face; mesonotum with dark aeneous blue reflection, pile pale anteriorly, dark posteriorly with fairly dense and long hairs; pleural pile pale; fore basitarsus without long pale hair; ventral basal spines present; spur small; second and third tergites opaque black, each with a pair of large metallic bluish-green triangular spots with their apices directed inwards; fourth tergite dark metallic bluish-green; opaque regions of abdomen with dark pile, metallic areas with pale yellow pile; discal cross vein joining discal cell well beyond middle; posterior cross vein distinctly longer than section of fourth vein above it; wings smoky; squamae white, halteres pale yellow. Forceps of usual type, dark brown, a little swollen basally, strongly curved and tapering outwardly, apex obtuse. Length, 11.5–13 mm.; wing, 9–9.5 mm.

Female.—Similar to male. Front moderately narrowed, black, very lightly pollinose on upper half, broadly silvery pollinose on lower except immediately above antennae; antennae reddish brown, third joint slightly longer than broad; arista black, distinctly shorter than width of face; face very moderately excavated, coated with grayish pollen; a whitish pollinose spot on inner side of humerus,

hind femora but slightly thickened, spinose on posterior two-thirds of ventral surface; discal cross vein of moderate length, but little oblique.

Walker's description of this species states that the abdomen is linear, a little narrower than the thorax and "fully thrice its length." In Williston's quotation, it is stated "fully twice its length." However, the abdomen is not unusually long. In form and size it is an average species of *Xylota*. The unusual length of the abdomen, as given by Walker, led Williston to believe that it might be the same as his species *elongata* =(female *angustiventris*).

Metcalf has figured the genitalia of *flavifrons* under the name *Xylota obscura* Loew.

Distribution.—Walker's material of *flavifrons* and *communis* came from St. Martins Falls, Canada. *X. obscura* Loew was recorded from the Red River of the North, Canada. The species has been recorded under the name *obscura* from Washington, Oregon, and California (Williston; but all three of these records=*barbata* Loew); Nebraska (Hunter); Wisconsin (Graenicher); Connecticut (Britton); Oregon (Lovett and Cole); Colorado (Jones). Material at hand: Franconia, New Hampshire (Mrs. A. T. Slosson), North Mountain, June 8, 1898 (C. W. Johnson), Lake Tear, Mount Marcy, 4,300 feet, July 12, 1918 (W. T. M. Forbes).

Type.—In British Museum.

XYLOTA BARBATA Loew

Rather large, robust species, 10–13 mm. Antennae black, third joint rounded, arista black. Longer than width of face; fore basitarsus of male without long hair, ventral surface with 4–5 spines basally and 2–3 apically; metasternum pubescent; hind trochanters of male with short spur; second and third tergites opaque black, each with a pair of large bluish-black metallic spots; discal cross vein joining discal cell beyond middle; posterior cross vein longer than section of fourth vein above it; metathoracic spiracle unusually large, larger than third antennal joint.

Distribution.—Apparently a common species west of the Rocky Mountains. Has been taken at Kaslo, British Columbia, and is reported from Quebec (Gibson).

Type.—In Museum of Comparative Zoölogy.

XYLOTA ANGUSTIVENTRIS Loew

Xylota elongata WILLISTON, in part.

A fairly large, elongate species, 9–13 mm.

Antennae and arista black, third joint large, longer than broad and longer than front in female, measured across ocelli; arista longer than width of face; pale parts of legs very light yellow; fore basitarsus of male without long hair, ventral spines present; metasternum

pubescent; hind trochanter of male with spur; abdomen elongate, fourth tergite longer than broad; male with a pair of oblong yellow spots on second tergite, female with second tergite dark, sometimes with a trace of the yellow spots; discal cross vein joining discal cell beyond its middle; metathoracic spiracle fairly large, but smaller than third antennal joint.

Occasional males have the yellow spots almost obscured.

Distribution.—A fairly common species in eastern North America, not recorded south of North Carolina. Has been recorded from Nebraska (Hunter, Jones).

Type.—In Cambridge Museum Comparative Zoölogy.

XYLOTA BICOLOR Loew

This species and *flavitibia* have the same abdominal coloration, chiefly reddish orange. There would be no difficulty determining these species from the other Xylotae except that the fourth tergite is sometimes obscured by dark, diffuse markings, in which case they may be confused with *segnis* and *notha.* Unfortunately, no better character than color seems available for separating these two from the other Xylotae, but on the whole the coloration is sufficiently characteristic so that there should be little difficulty in identifying them.

Large, fairly robust species, about 13 mm. Antenna large, noticeably longer than width of front of female, black; arista yellowish, darkened on outer half, longer than width of face; anterior basitarsus of male without long hair or black spines on ventral side; metasternum pubescent; hind trochanter of male without spur; abdomen, except first tergite, reddish orange; male genitalia entirely reddish orange, styles but little longer than broad; discal cross vein joining discal cell at middle; metathoracic spiracle distinctly smaller than third antennal joint. Metcalf has figured the male genitalia and Greene has figured the puparium.

Distribution.—A fairly common species east of the Mississippi. Not reported south of North Carolina. Recorded from Colorado (Jones), prbably a misidentification for *flavitibia* Bigot.

Type.—In Museum of Comparative Zoölogy.

XYLOTA FLAVITIBIA Bigot

A rather large, robust species, about 12 mm.

Antennae black, rather small, in female distinctly shorter than width of front at middle, third joint rounded; arista black, a little shorter than width of face; anterior basitarsus of male with long hair and ventral spines; metasternum pubescent; hind trochanter of male with spur; abdomen reddish orange beyond first tergite, sometimes marked with diffuse dark spots; discal cross vein joining discal

cell beyond middle; metathoracic spiracle about size of third antennal joint.

Because of coloration and distribution this species can only be confused with *notha*. Its broader head, with corresponding broadening of front and face, and its comparatively short antenna and arista serve to distinguish it from *notha*.

Distribution.—A fairly common species in the West: Nebraska, Colorado, New Mexico, Idaho, and Washington. Townsend recorded it from the District of Columbia—probably a specimen of *bicolor* with dark apical markings.

Type.—In British Museum.

XYLOTA ARGOI, new species

Female.—Medium sized, blackish species with the abdomen largely yellowish brown. Head broadly elliptical, tending to be flattened on outer sides; front rather narrow, shining black with pollinose band just below middle; ocelli a little advanced before hind margins of eyes; antennae black; third joint as broad as long, rounded; arista black, about equal in length to width of face; face between eye and lateral oral margin slightly narrower than width of third antennal joint; mesonotum with very inconspicuous pale pile, a few longer hairs intermixed; femora black; fore and mid tibiae yellowish basally and apically; hind tibia yellowish basally; fore and mid tarsi dark brown, paler basally; hind tarsi blackish; first tergite black, the second tergite with a median posteriorly produced black mark; remainder of second, the third and anterior half of fourth yellowish brown, their sides briefly darkened, remainder of abdomen blackish; wings smoky; squamae and plumula whitish; halteres yellowish. Length 10 mm., wing 7.5 mm.

Type locality.—Blue Mountains, Washington, June, 1924 (V. Argo).

Type.—Cat. No. 27741, U.S.N.M.

XYLOTA RUFIPES Williston

(Notes based on type in British Museum.) Arista distinctly longer than width of face; metathoracic spiracle distinctly smaller than third antennal joint; metasternum merely pubescent; abdomen, except for the black basal segment, purplish red; legs reddish brown, hind tarsi darker; hind femur long and slender; hind trochanter of male spurred. Length 10–11 mm.

Type locality.—Omilteme in Querrero, 8,000 feet, Mexico (H. H. Smith).

Type.—In British Museum.

XYLOTA STENOGASTER Wiliston

(Notes based on type in British Museum.) Antennae blackish brown; third joint large; abdomen deep shining steel-blue, hind

margins of tergites 2 and 3 opaque black; metathoracic spiracle as large as third antennal joint. The constricted abdomen which Williston noted for the male of this species is an abnormality due to shrinkage in drying. Male with a well developed spur.

Type locality.—Omilteme in Querrero, 8,000 feet, Mexico (H. H. Smith).

Type.—In British Museum.

XYLOTA BRACHYGASTER Williston

Tergites 2 and 3 each with a pair of small yellow spots; anterior border of wing brown, hyaline behind; metathoracic spiracle large; spur on male trochanter barely suggested.

Type locality.—Omilteme in Querrero, 8,000 feet, Mexico (H. H. Smith).

Type.—In British Museum.

LIST SHOWING SYNONOMY AND CHANGES MADE IN GENERIC ASSIGNMENT OF SPECIES DESCRIBED UNDER XYLOTA

(Subsequent to the Kertesz Catalogue)

arquata Say	= *Syrphus arquata* (Say).
pachymera Loew	= *Planes pachymera* (Loew).
pauxilla Williston	= *Planes pauxilla* (Williston).
pretiosa Loew	= *Planes pretiosa* (Loew).
vagans Wiedemann	= *Planes vagans* (Wiedemann).
anthreas Walker	= *Xylotomima anthreas* (Walker).
baton Walker	= *Xylotomima baton* (Walker).
chalybea Wiedemann	= *Xylotomima chalybea* (Wiedemann).
curvipes Loew	= *Xylotomima curvipes* (Loew).
dascon Walker	= *Xylotomima nemorum* (Fabricius)?
fascialis Coquillett	= *Xylotomima anthreas* (Walker).
fraudulosa Loew	= *Xylotomima baton* (Walker).
libo Walker	= *Xylotomima libo* (Walker).
marginalis Williston	= *Xylotomima libo* (Walker).
nemorum (Fabricius)	= *Xylotomima nemorum* (Fabricius).
metallica Wiedemann	= *Xylotomima metallica* (Wiedemann).
plesia Curran	= *Xylotomima plesia* (Curran).
pigra (Fabricius)	= *Xylotomima pigra* (Fabricius).
purpurea Walker	= *Xylotomima chalybea* (Wiedemann).
rubiginigaster Bigot	= *Xylotomima vecors* (Osten Sacken).
subtropica Curran	= *Xylotomima metallica* (Wiedemann).
vecors Osten Sacken	= *Xylotomima vecors* (Osten Sacken).
bivittata Bigot	= *Tropidia bivittata* (Bigot).
coloradensis Bigot	= *Tropidia coloradensis* (Bigot).
metallifera Bigot	= *Xylotodes metallifera* (Bigot).
oarus Walker	= *Brachypalpus oarus* (Walker).
aepalius Walker	= *Calliprobola aepalius* (Walker).
coarctata Wiedemann	= *Tatuomyia coarctata* (Wiedemann).
plagiata Wiedemann	= *Crepidomyia plagiata* (Wiedemann).
ventralis Walker	= *Crepidomyia ventralis* (Walker).
subcostalis Walker	= *Quichuana subocstalis* (Walker).

Genus CALLIPROBOLA Rondani

Calliprobola Rondani, Shannon, Proc. Ent. Soc. Wash., vol. 18, p. 108, 1916. Table of species given.

The genotype, *C. speciosa* Rossi, differs considerably from the American species in the shape of the head. The antennal prominence is above the middle of the head and is very noticeably projecting; the face has a gentle tubercle-like swelling and the epistoma projects downwards. In the American species the head is distinctly elliptical; the antennal prominence is but little projecting; the face is concave and the epistoma truncate—just as in *Xylota.*

CALLIPROBOLA AEPALIUS (Walker)

Calliprobola aepalius (Walker).
Brachypalpus sorosis Williston.

Walker's type specimen of *Xylota aepalius* is in excellent preservation. The species has been recorded from New Jersey, North Carolina, and Georgia.

Type.—In British Museum.

CALLIPROBOLA CRAWFORDI Shannon

Male genitalia has been figured by Metcalf. Idaho, Washington, Oregon, British Columbia, California.

Type.—In U. S. National Museum.

CALLIPROBOLA ALDRICHI Shannon

Male genitalia figured by Metcalf. Mount Ranier, Washington (Aldrich); Moscow Mountains, Idaho, June 10, 1920 (Shannon); Gold Lake Camp, Plumas County, California, July 19, 1916 (H. G. Dyar).

Type.—In U. S. National Museum.

CALLIPROBOLA OPACUS Shannon

Washington, Alaska.

Type.—In U. S. National Museum.

CALLIPROBOLA PULCHER Williston

Washington, Oregon, Idaho, British Columbia.

Type.—In U. S. National Museum.

Genus POCOTA St. Fargeau and Serville

Two North American species have been assigned to this genus, *grandis* Williston and *bomboides* Hunter. However, the two prove to be very distinct generically. A comparison of *bomboides* with

apiformis (genotype of *Pocota* European) shows the two to be congeneric and *bomboides* is therefore retained in *Pocota*. The first posterior cell in *Pocota* is closed at the wing margin; the legs are simple and the hind femur slender. These characteristics combined with the dense pubescence allies *Pocota* to certain of the Criorrhinini. *Hadromyia* is of a Xylotine character.

POCOTA BOMBOIDES Hunter

The venation and metasternum in this species differ from those in all other Xylotini. The shape of the face is the same as in *Xylota* and *Hadromyia*, but the venation and pubescence indicates a relationship to certain of the Criorrhinini. Anterior half of mesonotum yellow pilose; posterior half black; scutellum intermixed black and yellow pilose; abdomen chiefly black pilose; yellow on anterior half of fourth and sometimes along lateral margins of abdomen; fourth tergite blackish, dark green, aeneus on anterior half; metasternum pubescent, greatly reduced, each sclerite being about the size of metathoracic spiracle and longer than broad; mid femora of male simple; first posterior cell but little longer than broad, the apex acute and very close to wing margins. The genitalia are strikingly different from those of *grandis*. The basal lobe of the style in *grandis* is small, swollen, and but little differentiated from the style; the style acutely pointed. The basal lobe of the style of *bomboides* is very large, deeply sunken, saucerlike, and well differentiated from the style; style obtusely pointed, spinose.

Type locality.—Summit Sierra Nevada, California. Has also been collected on summit of Mount Moscow, Idaho. The males are swift fliers and love to poise in midair.

Type.—In University of Nebraska.

Genus HADROMYIA Williston

Hadromyia Williston.
Hadromyia, as synonym of *Pocota*, Williston.

HADROMYIA GRANDIS (Williston)

One of the largest of Syrphidae. Anterior half of mesonotum yellow pilose, posterior half and anterior two-thirds of abdomen black pilose; fourth tergite bright green-aeneous with yellow pile; metasternum pubescent, of normal development; base of middle femora of male with long curved spine; first posterior cell twice as long as wide; apical cross vein joining third vein acutely, a distinct petiole beyond the angle; posterior cross vein twice as long as upper outer section of discal cell (venation like that of *Xylota* in general aspect). Length 20–23 mm.

This species is of northwestern distribution: British Columbia, Vancouver Island, Washington, Oregon, Idaho.

Type.—In U. S. National Museum.

SOUTH AMERICAN XYLOTINI IN THE NATIONAL COLLECTION

KEY TO GENERA OF SOUTH AMERICAN XYLOTINI

A¹. Metasternum pilose.
  B¹. Hind femur with one or two apical toothlike processes ventrally.
    C¹. Hind femoral process consisting of one tooth; hind coxa without spur (*Ortholophus* Bigot?) ---------- **Tropidia** Meigen.
    C². Hind femoral process bidentate; hind coxa with small spur.
      D¹. Body very elongate; discal cross vein simple; males holoptic. **Acrochordonodes** Bigot.
      D². Body broad; discal cross vein with a free-ending branch; males dichoptic ---------- **Stilbosoma** Philippi.
  B². Hind femur without apical process; face subcarinate.
    C¹. Wings nearly devoid of villi, glassy in appearance; arista shorter than width of face ---------- **Syritta** St. Fargeau & Serville.
    C². Wings villose, not glassy; arista distinctly longer than width of face. **Planes** Rondani.
A². Metasternum pubescent or bare.
  B¹. Body dark colored.
    C¹. Face black, with a longitudinal median ridge and two oblique ridges.
      D¹. Abdomen strongly constricted basally --- **Tatuomyia**, new genus.
      D². Abdomen of nearly uniform width ------ **Crepidomyia**, new genus.
    C². Face bright yellow with an obtuse longitudinal ridge; metathoracic spiracle distinctly larger than third antennal joint; hind trochanters of male spurred ---------- **Sterphus** Philippi.
    C³. Face bluish-black, gently concave in profile; metathoracic spiracle much smaller than third antennal joint; hind trochanters simple. **Philippimyia**, new genus.
  B². Body entirely reddish yellow; very large and robust -- **Eriophora** Philippi.

Genus ORTHOLOPHUS Bigot

The type specimen of *Ortholophus notatus*, was described by Bigot as having the hind femur less swollen than in *Syritta* and not spinose beneath. This character would be sufficient to exclude the species from *Tropidia*.

The same specimen now lacks the legs, which presumably were broken off since the time the species was described, as definite mention was made of the legs. The head was also broken off but glued onto the specimen again. It is of the same type found in *Tropidia nigricornis* Philippi (described below) and certain other characteristics of the body definitely ally it to *Tropidia*.

ORTHOLOPHUS NOTATUS Bigot

Description based on type specimen.

Male.—The facial carina is more sharply defined than in any other species of Syrphidae except *T. nigricornis* Philippi. A small por-

tion of the face below the antennae is flat and in line with the frontal triangle; the keel begins very abruptly and continues as a strong ridge to the oral margin; thorax black with rather long pile; abdomen blackish with large bluish white pollinose spots on sides of second and third tergites, the fourth entirely pollinose; metasternum divided as in *Tropidia* and pilose; stigmatical cross vein present; apical cross vein in line with posterior cross vein; anal vein rather prolonged beyond anal cell. Length, 7 mm.

Only the type specimen is known. Habitat, Chile.

Type.—In British Museum.

Genus TROPIDIA Meigen

TROPIDIA NIGRICORNIS Philippi

The facial carina is developed as described under *Ortholophus*. Frontal triangle and face, except keel, silvery pollinose, upper sides of face yellowish; hind femur greatly swollen, the saw-tooth projection moderate; base of abdomen with large black triangle, the apex extending backward to beyond middle of second tergite; remainder of second tergite and the third reddish yellow; fourth tergite shining black with opaque reddish posterior margin; stigmatical cross vein absent.

One male; Chile (A. Faz). Determined by J. M. Aldrich.

Type.—Santiago, Chile (?)

TROPIDIA BIVITTATA (Bigot)

Xylota bivittata BIGOT.

A typical species of *Tropidia*. Face yellow on the sides; scutellum black; legs black; abdomen mostly reddish yellow on tergites two and three; fourth with anterior and posterior margins yellow.

Type.—In British Museum.

Genus ACROCHORDONODES Bigot

Genotype.—*Acrochordonodes dentipes* (Fabricius).

Acrochordonodes at one time regarded a member of the New York State fauna (under *Senogaster comstocki* Williston) as strictly tropical. It is a close relative of the *Syritta* group. The head is very similar to the *Syritta* type; the abdomen is constricted at the third segment and the hind femur has an outer apical projection.

ACROCHORDONODES DENTIPES (Fabricius)

Stenogaster comstocki WILLISTON, Proc. Amer. Philos. Soc., vol. 20, p. 326, (1882).

A male and female from Georgetown, British Guiana (H. W. B. Moore), at hand. (Determined by F. Knab.) Special features

worth noting are: The very elongate front of the male and very narrow front of the female about six times as long as broad across ocelli; the spur on the hind coxa in both sexes (only one other case, *Stilbosoma*, is known to the writer where a spur actually occurs on the coxa in the Syrphidae; usually the trochantal spur, which is frequent in Syrphidae, is called the coxal spur); the trochanter bears an obtuse spur; the hind femur has a long tooth and a shorter one subapically and the hind tibia has a subapical spur. The abdomen of the male is peculiar in that it is constricted at the third segment, whereas the second is large, only narrowed behind. This as far as known is found in only one other genus of Syrphidae, the genus *Rhopalosyrphus* of the Microdontinae. The general rule in Syrphidae when the abdomen is constricted is to have the main constriction at the second segment and the third broadened.

Type.—Location unknown.

Genus PLANES Rondani

A discussion of this genus with a key to all the known species is given in the section dealing with the North American fauna. Two South American species are here described.

PLANES BOLIVIENSIS, new species

Male.—Somewhat smaller than *vagans*, and differs otherwise in having the ocellar triangle much broader in proportion to its length; the antennal prominence less developed; the face nearly straight in profile and less retreating; the mesonotal stripes more apparent; fore and mid tibiae brownish; and the abdomen more aeneous.

Female.—The female has the front decidedly broader than is the case in *vagans* and the abdominal spots much less developed, being quite absent on the third tergite (this may be a variation of typical specimens). Length, 9 mm.; wing, 7.5 mm.

Type.—Cat. No. 28673, U.S.N.M.

Type locality.—Huachi Beni, Bolivia, September (W. M. Mann, while on the Mulford Biological Expedition, 1921–22).

Male type, female allotype, male paratype.

PLANES MINOR, new species

Female.—Small, slender species. Front narrowed above, at vertex but little broader than width of third antennal joint, more than twice as wide below, greenish black, with a rather broad, faintly pollinose stripe at middle; antennae yellowish brown; third joint longer than first two together and a little more than twice as long as broad; arista slightly longer than length of antenna; face shining black, yellowish brown at oral margin, concave in profile, the keel inconspicuous;

mesonotum flat, bronzy black with short yellowish pile and a pair of faint median stripes; fore and mid legs with femora black, yellow at bases and tips; tibiae brownish yellow; tarsi pale yellow, the last two joints blackish; hind femur black, moderately swollen for the genus; tibia brownish, arcuate with apical spur; tarsus pale brown, last joints darker; abdomen slightly constricted at second and third segments, each of which bears a pair of small yellow spots; wings smoky; discal cross vein at middle of discal cell, but little oblique; petiole beyond first posterior cell as long as discal cross vein; squamae and halteres pale. Length, 6.5 mm.; wing, 5 mm.

Type locality.—Ivon Beni, Bolivia (February, 1922, William M. Mann, while on the Mulford Biological Expedition).

Type.—Cat. No. 27859, U.S.N.M.

Nearest related to *vagans* (recorded above). The front is narrower, the mesonotal stripes much less distinct, and the hind femur less swollen.

Genus STILBOSOMA Philippi

Genotype.—*Stilbosoma rubiceps* Philippi (by present designation).

STILBOSOMA RUBICEPS Philippi

Several peculiar features characterize this species. The body is entirely dark except for the reddish yellow front and face; the antenniferous projection is very prominent, causing the face to be deeply concave; the eyes of the male are nearly as widely separated as in the female; the antennae are large, the third joint much larger than the metathoracic spiracle; arista as long as width of face; thorax and abdomen broad; metasternum bare; hind coxa with small spur; hind trochanter simple; hind femur enlarged with a bidentate projection at apical, ventral, and outer position; all the puvilli and bases of claws whitish, the posterior ones large; discal cross vein joining discal cell far beyond middle and bearing a free-ending branch; first posterior cell closed practically at the wing margin.

The presence of a spur on the discal vein is unique in the Syrphidae, and Mr. Curran has opened an interesting question concerning its origin. Mr. Curran writes:[6] "The anterior cross vein in the Syrphidae, or at least some of them, is not wholly a cross vein but is a fusion of what is termed the fifth radius and the cross vein. This may not be true in the Muscoid groups, but we have no proof that it is or is not, but it is certainly true in the Syrphid genus *Stilbosoma* Philippi from Chile."

The discal cross vein leaves the third vein in a very diagonal direction which gives it the appearance of a typical R_5 forking in

[6] 54th Report Ent. Soc. Ontario, p. 21, 1923.

a normal manner from R_4. The discal (r—m) cross vein is then forked beyond its middle, one branch ending free in the first posterior cell and the other joining the discal cell. The general appearance given is that of a normal R_5 which ends shortly after its origin and which has a short cross vein extending between it and the discal cell. This may be a modification of the spurious vein. But it would seem that we have here a relic of R_5; and perhaps the "adventitious" branch on the third vein in most Microdontinae and Ceriodinae is also a relic of R_5.

One male and one female, Valparaiso, Chile (A. Faz); one female, Santiago, Chile (A. Faz). Determined by J. M. Aldrich. Two other species have been described in this genus—*cyaneum* Philippi; *nigrinerve* Philippi.

Type.—Santiago, Chile (?).

Genus STERPHUS Philippi

Genotype.—(*Sterphus antennalis* Philippi) (by original inclusion)=*Xylota coerulea* Rondani.

STERPHUS COERULEA (Rondani)

Xylota coerulea Rondani, Archivio per la Zoolog., vol. 3 (sep.), p. 8, 1863.
Sterphus antennalis Philippi, Verh. Zool.-bot. Ges. Wien., vol. 15, 1865, p. 737.

Sterphus coerulea possesses all of the essential features of *Xylota* (*sensu stricto*): Metasternum faintly pubescent; head broadly elliptical; arista as long as width of face; metathoracic spiracle larger than third antennal joint; hind trochanter of male spurred; venation of the same type. It differs in having the face and frontal triangle golden yellow, the face raised to a broad median ridge, appearing inflated; width of lower face—that is, between oral margin and lower margin of eye—nearly three times as broad as width of third antennal joint (about equal in width in *Xylota segnis*); the prothoracic spiracle enlarged and yellowish; the body broader with distinctly longer pile; abdomen shining, very dark blue.

One male, Chile (E. C. Reed); two males, Valparaiso, Chile (A. Faz). Determined by J. M. Aldrich.

Type.—Location unknown.

STERPHUS AURIFRONS, new species

Mesonotum largely obscured by brownish pollinosity, pile brownish; all the tibiae are more or less reddish brown; abdomen largely shining very dark metallic green, opaque on posterior margins of second and third tergite, black pilose, rather long and dense on apex of abdomen, rather long and yellowish on anterior corners of second,

third, and fourth tergites; abdominal venter shining black with yellow pile; wings brownish. Length, 14 mm.; wing, 11 mm.

S. coerulea differs in being entirely shining very dark blue, the mesonotum rather sparsely brownish pollinose; the legs entirely black; the abdomen mostly black pilose, pale pilose on anterior corners of tergites and on the venter; wings dark infuscated anteriorly, subhyaline behind.

Type locality.—Chile (J. Fernz).

Type male.—In British Museum.

Genus PHILIPPIMYIA, new genus

Entirely shining, dark blue with purplish reflections; head broadly elliptical, evenly rounded; antennae moderate; face narrow, the moderate length of the arista much longer than facial width; face protruding in profile, moderately concave; metasternum bare; hind trochanters simple; hind femur slender; claws small and entirely black; third vein curved downward; first posterior cell closed nearly at wing margin; alar lobe narrow.

Genotype.—*? Sterphus cyanocephala* Philippi.

PHILIPPIMYIA CYANOCEPHALA (Philippi)

? Sterphus cyanocephala Philippi, Verh. Zool.-bot. Ges. Wien, vol. 15, 1865, p. 738.

One male, Chile (E. C. Reed); one female, Santiago, Chile (A. Faz). Determined by J. M. Aldrich.

Type.—Santiago, Chile (?).

Genus CREPIDOMYIA, new genus

Of rather large and linear form and dark color. Face with three ridges, a longitudinal one and a lateral pair which extend obliquely from the oral margin to the eyes; metasternum bare, hind trochanter spurred in both sexes; petiole beyond first posterior cell one-half as long as discal crossvein.

Genotype.—*Crepidomyia tricrepis*, new species.

CREPIDOMYIA TRICREPIS, new species

Male.—Frontal triangle large, flat, and densely covered with pale yellow pollen; antennae black, moderate, third joint about one and one-half times as long as broad; arista a little longer than width of face across middle, yellowish basally, becoming whitish outwardly; face black with rather broad stripes of pollen within the lateral ridges; lower face more than twice as broad as third antennal joint; mesonotum black, a pollinose spot mesad of humerus and the trans-

verse suture pollinose; the pile very short and black, a few longer black hairs posteriorly; scutellum with short stout black marginal bristles; legs black, mid tarsi brownish; abdomen black, second tergite with pair of elongate yellowish spots; wings smoky. Length, 14 mm.; wing, 11 mm.

Female.—Front moderate, an inconspicuous pale pollinose band across middle; pollinose stripes on face very inconspicuous.

Type locality.—Rio Charape, Peru.

Type.—Cat. No. 27860, U.S.N.M.

Holotype male, Rio Charape, Peru, September 14 (C. H. T. Townsend); allotype and one male and one female paratypes, Piches and Perene, Vs., 2,000–3,000 feet, Peru (Sec. Georg de Lima).

CREPIDOMYIA PLAGIATA (Wiedemann)

Xylota plagiata Wiedemann, Auss. Zw. Ins., vol. 2, 1830, p. 92.

An easily characterized species by means of the golden yellow frontal triangle in the male, entirely blackish in the female; the three well developed facial ridges; the lateral mesonotal stripes of yellow pile, beginning behind the transverse suture and connecting posteriorly with the marginal scutellar fringe of yellow pile; and the fairly even infuscated stripe extending lengthwise through the middle of the wing. The male is spurred, female without spurs.

Originally described from Brazil. Material at hand from the Amazon, Brazil (H. W. Bates). In the British Museum.

TATUOMYIA, new genus

Rather large, shining black with a strongly constricted abdomen. Face with three longitudinal ridges; the lateral one less developed than in *Crepidomyia;* metasternum bare; trochanters unspurred; hind femur much enlarged, spinose beneath; hind tibia bidentate at apex below; anterior margins of wings black, on posterior half hyaline.

Genotype.—*Tatuomyia batesi*, new species.

TATUOMYIA BATESI, new species

Male.—Head subelliptical; frontal triangle fairly large, extending well forward; ocelli well advanced of occipital margin; frontal triangle flat, shining black. Antenna dark brown; third joint nearly three times as long as broad; arista about twice the width of the face; median facial ridge very prominent, straight; face black, lightly dusted with silvery pollen; thorax black, very inconspicuously pilose; legs, including tarsi, black, the basal half of mid tibia and posterior half of hind femur brownish; second abdominal segment greatly

constricted, four times as long as its narrowest width; brownish on the constricted portion, opaque black on the expanded posterior portion.

Female.—Front at vertex narrower than length of third antennal joint; at base of antennae it is equal to length of an antenna. Length, 15 mm.; wing, 11.5 mm.

Type locality.—Ega, Brazil (H. W. Bates).

Described from two specimens, male type, female allotype, both in British Museum Natural History.

"*Xylota*" *coarctata* Wiedemann, congeneric with *batesi*, differs as follows: Mouth margin whitish, humeri yellow; petiole of second segment bright yellow; legs black; inner half of wings yellowish.

Williston [7] recognized that *Xylota coarctata* Wiedemann on the basis of the keeled face and petiolate abdomen, should be placed in some other genus. The species bear a very marked resemblance to certain tropical American wasps of the genera *Polybia* and *Tatua.*

T. batesi has been named for H. W. Bates, the famous early naturalist of the Amazon.

Genus ERIOPHORA Philippi

This genus was erected for a curious species of Chilean Syrphidae, but was later made a synonym of *Criorrhina* by Williston.[8] The writer finds that although it possesses certain characteristics which tend to ally it to *Criorrhina*, there are other peculiarities which well warrant keeping it as a distinct genus. The venation shows a marked difference from that of the genotype of *Criorrhina*, *asilica.* The apical cross vein has an unusually broad basal angle in *Eriophora* while in *Criorrhina* the apical cross vein is in alignment with the posterior cross vein. In *asilica*, the posterior cross vein is twice the length of the section of the fourth vein above it, while in *Eriophora* the posterior cross vein is only one-half the length of this section of the fourth vein. The antennae also show a marked difference between the two. In *asilica* the two basal joints are each much longer than broad and the arista is placed on the upper outer corner of the third joint. In *Eriophora* the basal joints are as broad as long and the arista is of the basal type, also the scutellum is nearly twice as broad as long, and truncate on posterior margin.

ERIOPHORA AUREORUFA Philippi

Only one species is known for this genus, which is entirely bright orange in color, clothed with dense, stiff pile except for the black

[7] Trans. Amer. Ent. Soc., vol. 13, 1886, p. 321.
[8] Idem, p. 322.

jowls and the shining black abdominal venter clothed with black pile. The apex of the wing is infuscated. Length, about 20 mm.; wing, 17 mm. One female, Chile, in the British Museum.

SPECIES OF XYLOTINI FROM SOUTH AMERICA NOT SEEN BY WRITER

The generic position of some of these species may be erroneous.

Tropidia flavimanna Philippi (Chile).

Tropidia rubricornis Philippi (Chile).

Xylota aurifacies Bigot (Chile).

Xylota chloropyga Schiner (Colombia).

Xylota coarctata Wiedemann=*Tatuomyia coarctata* (Wiedemann).

Xylota genuina Williston=*Crepidomyia?*

Ceriogaster fuscithorax Williston. A genus apparently closely allied to *Tatuomyia.* Differs in having the face gently convex in profile; abdomen broadest on the fourth segment; discal cross vein joining discal cell shortly before the middle.

Williston described another species at a later date in the Biologia Centralia Americana calling it *Ceriogaster auricaudata.* This species, the type examined by the writer, apparently belongs to the Temnostomini and it is doubtful if it is actually congeneric with the genotype of *Ceriogaster.*

The type specimen of *Xylota ventralis* Walker, described from the Aru Islands, Malay Archipelago, apparently belongs to the genus *Crepidomyia.*

INDEX

[This index includes the names included in this paper. Valid generic names are in bold-face type ; valid specific or varietal names in roman ; and synonyms in italics.]

O

THE NORTH AMERICAN TWO-WINGED FLIES OF THE FAMILY SIMULIIDAE

By Harrison G. Dyar,
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and

Raymond C. Shannon,
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Since the publication of J. R. Malloch's treatment of the "American Black Flies or Buffalo Gnats" in 1914[1], the collection of these insects in the United States National Museum has been increased several fold. The present publication is based on the material used by Malloch, and the additional material which has been collected mostly by Dr. J. M. Aldrich and the writers. Also material has been loaned us by J. S. Hine, the Illinois Natural History Laboratory (through T. H. Frison), the Biological Survey, and H. C. Hallock.

The generic arrangement here used is primarily based on a previously unused character, namely, the presence or absence of hairs on the second section of the radius (between the stem vein and base of the radial sector). Only 4 genera are here recognized, which is in sharp contrast to the 17 recognized by Enderlein. We have found Enderlein's classification entirely unsuited to the American fauna. Both *Eusimulium pecuarum* and *mutatum* which he places in the subfamily Prosimuliinae, a group based on the character of the forking of the radial sector, have the radial sector simple. In fact, he erected the genus *Cnepha* to contain these two species upon this particular character which, we have just mentioned, they lack. In practically all other instances where the American fauna is involved in his treatment we have found that the genera he proposed are too finely drawn and of no practical value.

The region included in the present work is the mainland of North America and Greenland. Forty-seven species and two races are recognized, of which we have more than 3,000 adult specimens. Mal-

[1] U. S. Dept. Agr., Bur. Ent. Tech. Ser., No. 26, 1914.

No. 2636.—Proceedings U. S. National Museum, Vol. 69, Art. 10.

loch recognized 3 genera and 31 species for the same region, 5 of which are here considered as synonyms.

The chief differences between Malloch's and the present treatment are in the arrangement of the groups and species and the greatly extended distribution of species which the great abundance of material now at hand affords.

For specific differentiation, characters of the female hypopygium have been employed, as well as those of the male, which has enabled more accurate differentiation of some of the similar species.

Attention should be called to A. W. Jobbins-Pomeroy's publication.[2] Detailed accounts of the biology and figures of the larva, pupa, and male genitalia of *Simulium venustum*, *S. jenningsi (=venustum)*, *S. bracteatum (=E. aureum)*, and *S. pictipes* are given.

A. E. Cameron in a bulletin [3] gives a very extended account of the morphology and biology of *Simulium simile* Malloch (=*arcticum* Malloch).

In certain of the descriptions of reared species following, where the characters depend upon miscroscopic preparations, we have in some cases mounted more than one specimen of a series. In these cases the mounted specimens are designated as "types," the rest of the series which agree macroscopically, but have not been mounted, as "paratypes."

TABLE OF GENERA OF SIMULIIDAE

Radius setose on its entire length.
  Radius joining costa at middle of coastal vein; radial sector forked; antenna 10-jointed -- **Parasimulium** Malloch.
  Radius joining coastal vein far beyond its middle.
    Radial sector with long fork; hind basitarsus not produced apically; second hind tarsus without dorsal incision and much longer than width of basitarsus; front usually broad--------------- **Prosimulium** Roubaud.
    Radial sector simple; hind basitarsus produced or not produced apically, second hind tarsus with or without dorsal incision and less than twice the width of the basitarsus; front narrowed---- **Eusimulium** Roubaud.
Radius bare between the stem vein and base of radial sector; radial sector simple; hind basitarsus produced apically; the second hind tarsus with dorsal incision and less than twice the width of basitarsus.
Simulium Latreille.

Genus PARASIMULIUM Malloch

Parasimulium Malloch, U. S. Dept. Agr., Bur. Ent. Tech. Ser., No. 26, 1914, p. 24.

Very small brownish species; antennae 10-jointed, large, being longer than fore basitarsus and twice as long as the dorso-lateral thoracic sclerite. Front broad, widened above; clypeus very narrow,

[2] U. S. Dept. Agr., Bull. No. 329, March, 1916.
[3] Dom. Canada, Dept. Agric., Bull. No. 5, New Series, 1922.

about four times as long as broad; mesonotal pile short and fine, longer and coarser posteriorly; scutellum with long coarse pile, directed anteriorly; tarsi slender; hind basitarsus without projection; following joint without basal scale; costa, subcosta and radial veins with rather long hairs on dorsal and ventral surfaces; subcostal joining costa near basal third of costal vein; radius joining costal vein at its middle; radial sector forked; R_{4+5} joining costal a considerable distance before tip of costa; section of radius between stem vein and base of radial sector not longer than section of costa beyond R_{4+5}; fold between media and cubitus scarcely visible and apparently unforked; mesosternum flat, the semicircular portion barely discernible; abdominal tergites and sternites well developed, fully chitinized. Only one species, the genotype.

PARASIMULIUM FURCATUM Malloch

Parasimulium furcatum Malloch, U. S. Dept. Agr., Bur. Ent. Tech. Ser., No. 26, 1914, p. 24.

Antennae pale yellow, basal joint brownish; mesonotum dark brown; pleurae yellowish; legs yellowish, hind femora darker; abdomen dark brown; claws untoothed.

Only a single specimen is known for this genus and species, which in several respects appears to be the most generalized form known for the family.

Type locality.—Humboldt Co., Calif. Type in U. S. National Museum, Cat. No. 15403, U.S.N.M.

Distribution.—California: Humboldt County, June 9, 1903 (H. S. Barber).

Genus PROSIMULIUM Roubaud

Prosimulium Roubaud, Compt. Rend. Acad. Sci. Paris, vol. 143, 1906, p. 519.

Prosimulium Malloch (part), U. S. Dept. Agr., Bur. Ent., Tech. Ser., No. 26, 1914, p. 15.

Prosimulium Enderlein (part), Deutsch. Tierarzt. Woch., Hanover, 1920; Zool. Anz., vol. 53. 1921, p. 43.

Helodon Ennderlein, Deutsch. Tierarzt. Woch., Hanover, 1920; Zool. Anz., vol. 53, 1921, p. 43.

Genotype.—Simulium hirtipes Fries.

Medium sized to large species, usually dark colored, sometimes yellow; antenna usually 11-jointed, sometimes 9-jointed; front usually rather broad, rarely narrow; clypeus broad, a little longer than its breadth; tarsi slender; hind basitarsus without apical projection; second joint without subbasal dorsal excision, elongate, being much broader than width of basitarsus; claws bifid or simple; subcostal joining radius at or a little beyond middle of costal vein; radius joining costa far beyond middle; R_{4+5} joining costal vein very near its tip; radial sector forked (that is, R_{2+3}, distinct from R_{4+5});

upper side of radial vein piliferous on its entire length; fold between media and cubitus distinct, forked; chitinization of tergites usually reduced, of the sternites usually much reduced.

KEY TO THE SPECIES OF PROSIMULIUM

Claws distinctly bifid (i. e., basal portion tooth-like); anal lobes of the female (below cerci) partially or not chitinized, with setae in a group.
  Integument yellow; front at greatest width about half its length; only mesepimeron tuft present ____________ **onychodactylum**, new species.
  Integument black; front broader; three pleural tufts, viz, on anterior sternopleura, lower pteropleura, and mesepimeron ____________ **pleurale** Malloch.
Claws not bifid.
  Antennae nine-jointed with basal joints black; legs black; female anal lobes as in *onychodactylum* and *pleurale* ____________ **novum**, new species.
  Antennae 11-jointed; basal antennal joints yellowish; legs usually yellowish; anal lobes of female chitinized and evenly setose like the cerci.
    Female ovipositor reaching tip of abdomen; anal lobes strongly produced and coarsely hairy ventrally.
      Third antennal joint distinctly enlarged as compared with the second; large species ____________ **magnum**, new species.
      Third antennal joint not conspicuously enlarged, medium-sized species.
        Stem vein dark pilose ____________ **dicum**, new species.
        Stem vein pale pilose ____________ **dicentum**, new species.
    Female ovipositor shorter and weaker; anal lobes evenly setose, not stronger ventrally; medium-sized species.
      Integument yellow ____________ **fulvum** Coquillett.
      Integument black.
        Male adminiculum evenly arcuate, broad, smooth ____________ **hirtipes** Fries.
        Male adminiculum ovate with narrow projecting center, the basal arms broad and lobed ____________ **exigens**, new species.
        Male adminiculum with lobed bifid center; basal arms detached.
          pancerastes, new species.

PROSIMULIUM ONYCHODACTYLUM, new species

A species that is quickly characterized by its brownish yellow integument; very narrow front, large antennae, yellowish legs, bifid claws. Ovipositor undeveloped, lips of opening membranous, not produced, spicular. Genital rod forked, limbs slender, weak outwardly but slightly expanded. Cerici rounded quadrate, wider than long. Lobes of last segment round, small, spicular, with a group of about 10 scattered setae; no chitinized area. (Figs. 10 and 11.)

Male and immature stages unknown.

Type locality.—Long's Peak, Colo.

Type.—Female, Cat. No. 28324, U.S.N.M.

Distribution.—COLORADO: Long's Peak Trail, timberline, 11,000 feet altitude, August 28 (T. D. A. Cockerell).

PROSIMULIUM PLEURALE Malloch

Prosimulium pleurale MALLOCH, U. S. Dept. Agr., Bur. Ent., Tech. Ser. No. 26, 1914, p. 17.

A species easily characterized by the bifid claws and the three pleural patches of pile.

Male and immature stages unknown. Ovipositor: Essentially as in *novum;* flaps rounded, slight spicular. Cerci transverse, twice as wide as long, strong, chitinized, setose. Tips of last segment very narrowly chitinized, the membranous ventral area large with a group of about six tubercles centrally, closely placed and bearing long slender setae. Genital rod widely forked, the arms very slender but widening to a strong, conical, outwardly dentate plate on each side. (Fig. 18.)

Four specimens at hand.

Type locality.—Kaslo, British Columbia. Type in U. S. National Museum, Cat. No. 15403, U.S.N.M.

Distribution.—ALASKA: Hurricane, July 15, 1921 (J. M. Aldrich). Camp 334, Alaska Eng. Com. July 9, 13, 1921 (J. M. Aldrich).
BRITISH COLUMBIA: Kaslo, June 18, 1903 (R. P. Currie).

PROSIMULIUM NOVUM, new species

In general appearance very close to *hirtipes*. Differs in having only nine joints to the antenna, the joints being unusually well separated and distinct; entire body, including antennae and legs, black; pilosity yellowish; stem vein with pale pile; squamal cilia whitish. Ovipositor, practically none; margins of opening membranous, curved, not produced backward. Ceri rounded, quadrate, not as long as wide; tips of last segment reduced, narrowly chitinized and setose above, rounded and membranous below, with a group of short stiff setae on large tubercles. Genital rod widely forked, the limbs first narrowed and black, then expanded into a large irregular chitinous plate. (Figs. 14 and 15.)

Length 4 mm.; wing 4.25 mm.

Apparently a mountain species. Specimens from Gospal Mountain, Idaho (J. M. Aldrich), bear labels "Bad on horses." Male and immature stages unknown. Forty specimens.

Type locality.—Two Medicine Lake, Montana.

Types.—Two females, *paratypes*, 30 females, Cat. No. 28325, U.S.N.M.

Distribution.—British Columbia: Kalso, July 5, 11, 1903 (H. G. Dyar).
California: Seneca, Plumas County, June 1, 1923 (V. S. Barber).
Idaho: Gospel Mountain, July 12, 1907 (J. M. Aldrich).
Montana: Two Medicine Lake, July 4, 1921 (H. G. Dyar). Belton, June 19, 1921 (H. G. Dyar).
Washington: Kitsap Lake, Bremerton, April 29, 1924 (H. G. Dyar). Hoodsport, May 3, 1924 (H. G. Dyar).

PROSIMULIUM MAGNUM, new species

The largest species in our fauna.

Female.—Closely allied to *hirtipes* but may be easily separated by its unusually robust appearance; two basal antennal joints yellowish, remainder dark; three basal antennal joints enlarged, remainder tapering to a point; fore tarsi more elongate, the basitarsus distinctly larger than antenna; stem vein pale pilose. Ovipositor: Much larger and stronger than *hirtipes*, reaching the tips of the last segment which are drawn out to equal the blunt cerci and strongly hairy. (Figs. 1 and 2.)

Male.—Essentially as in *hirtipes.* The spines on the claspers are much stronger and more widely separated than the *hirtipes* from the same locality (Figs. 22 and 23.)

Larvae and pupae were found by the junior author, April 12, 1925, in Dead Run, Va., a small stream that descends among rocks the sharp decline of the banks of the Potomac. The pupae project from an irregular, rather dense web on a leaf or stone where the water is swift, and are often densely crowded together. The pupal filaments are multiple-branched about 10 trunks, at the base of each tuft, which fork near the base, some fork a second or even a third time, the total number being 30–40.

Type locality.—Dead Run, Fairfax County, Va., from reared material.

Type.—Male, *allotype* female, *paratypes* 3 males, 2 females, Cat. No. 28326, U.S.N.M.

Fourteen specimens at hand.

Distribution.—Maryland: Plummers Island, April 19, 1903; April 28, 1909 (E. A. Schwarz, W. L. McAtee). Cabin John, April 28, 1912 (J. R. Malloch).
Michigan: Grand Ledge, April 28, 1912 (H. G. Hubbard).
Virginia: Great Falls, April 24, 28, 1915 (R. C. Shannon). Dead Run, April 12, 1925, April 19, 1914 (R. C. Shannon).

PROSIMULIUM DICUM, new species

Female.—Close to *magnum*. Antennae entirely dark; stem vein black pilose; body pile abundant and pale; legs dark or in part brownish yellow. Differs from *magnum* in being a little smaller; the darker basal antennae joints and smaller third joint a little broader than long. Ovipositor: Long, strong, sheaths darkly margined within, reaching near the end of the anal lobes. Cerci rounded quadrate, moderately sized, setose, and spicular. Anal lobes conically produced, reaching as far as cerci, sparsely setose above, densely and coarsely so ventrally. Genital rod down-curved at tip, forked, the arms short, with a short quadrate chitinous plate with produced angles. (Figs. 5 and 6.)

Type locality.—Hoodsport, Wash.

Types.—Two females, *paratypes* 3 females, Cat. No. 28327, U.S.N.M.

Thirty-five specimens at hand, all females.

Distribution.—ALASKA: Ketchikan, June 20, August 6, 1919 (H. G. Dyar).
BRITISH COLUMBIA: Prince Rupert, June 7–17, 1919 (H. G. Dyar).
WASHINGTON: Hoodsport, May 3–11, 1924, July 6, 1920 (H. G. Dyar).

PROSIMULIUM DICENTUM, new species

Differs from *dicum* in having stem vein pale pilose. The female anal lobes are more rounded, less coarsely hairy ventrally than in *dicum*. (Figs. 7 and 8.)

Type locality.—Truckee, Calif.

Type.—Female, Cat. No. 28328, U.S.N.M.

Distribution.—CALIFORNIA: Truckee, April 22, 1921 (H. G. Dyar).

PROSIMULIUM FULVUM Coquillett

Prosimulium fulvum COQUILLETT, Proc. U. S. Nat. Mus., vol. 25, 1903, p. 96.

The bright yellow color easily distinguishes this species in both sexes from all others of the genus except *onychodactylum* which has bifid claws. Female ovipositor weak, the cerci and abdominal tips as in *hirtipes* but weakly chitinized and pale. (Fig. 9.) Male genitalia as in *hirtipes*, except that the parts are weakly chitinized and pale brown instead of black. (Figs. 20 and 21.)

Fulvum is an abundant species in the mountainous regions, chiefly in the Pacific Northwest. It has been reported attacking man and animals. The immature stages remain unknown. One hundred and sixty-three specimens at hand.

Type locality.—Bear Paw Mountain, Mont. Type in U. S. National Museum, Cat. No. 6182, U.S.N.M.

Distribution.—ALASKA: Camp 327, Alaska Eng. Com. July 13, 1921 (J. M. Aldrich). Cape Fanshaw, June 22, 1919 (H. G. Dyar). Fourth of July Creek, July 21, 1921 (Alice Twitchell). Juneau, June 22, 1919 (H. G. Dyar). Katmai, June 10, 1917 (J. S. Hine). Seward, June 26, 1921 (J. M. Aldrich). Sitka, June 16, 1899 (T. Kincaid). Skagway, June 3, 1919 (H. G. Dyar). Virgins Bay, June 26, 1899 (T. Kincaid). Savonoski, Novak Lake, July 19, 1919 (J. S. Hine).

BRITISH COLUMBIA: Bear Lake, July 29, 1903 (R. P. Currie). Laggan, August 16, 1906 (Dyar & Caudell). Lake Atlin, July 23, 1919 (H. G. Dyar). Kaslo, June 29, 1903 (H. G. Dyar). South Fork Kaslo Creek, August 11, 1903 (H. G. Dyar). Kokanee Mountain, August 10, 1903 (A. N. Caudell). Mount Cheam, August 7 (J. Fletcher). Prince Rupert, June 7, 1919 (H. G. Dyar).

CALIFORNIA: Fallen Leaf, Lake Tahoe, June 18, 1916 (H. G. Dyar). Gold Lake, Plumas County, July 22, 1916 (H. G. Dyar).

COLORADO: Custer County (T. D. A. Cockerell).

IDAHO: Moscow Mountain, June 19–July 10, 1920 (A. L. Melander).

MONTANA: Belton, June 21, 1921 (H. G. Dyar). Glacier Park, July 1, 1921 (H. G. Dyar). Two Medicine River, July 27, 1921 (H. G. Dyar). Bear Paw Mountain, September 3, 1891 (H. G. Hubbard).

OREGON: Crater Lake, July 30, 1920 (H. G. Dyar).

WASHINGTON: Glacier, June 4, 1917 (H. G. Dyar). Hoodsport, May 31, 1924 (H. G. Dyar). Mount Ranier (M. W. Lyon, jr.). Lake Cushman, June 27, 1917 (H. G. Dyar).

YUKON TERRITORY: White Horse, July, 1919 (H. G. Dyar).

PROSIMULIUM HIRTIPES (Fries)

Simulia hirtipes FRIES, Mono. Simul. Suec., 1824, p. 17.

Female.—A rather variable species. Integument black; front rather broad, distinctly narrowed below, covered with loose pale pile; antennae 11-jointed, two basal joints yellowish or brown; thoracic pile usually yellowish, but ranging from whitish to blackish; legs largely yellow, black rarely predominating; fore basitarsus as

long as antenna; claws not produced basally; chitinous plates on segments 3, 4, and 5 distinctly reduced in width; all but the last sternite completely membranized; stem vein pale pilose. Ovipositor: Rather broad and large but thin and not produced backward, the valves broadly brown chitinized within, strigate spicular. Cerci quadrate, nearly twice as wide as long, anal lobes conical, as long as the cerci and like them evenly setose and spicular. Genital rod forked, each arm with short chitinous plate with produced corners. (Figs. 12 and 13.)

Male.—Pile much longer and usually darker: chitinization of tergites and sternites not greatly reduced. Hypopygium, side piece cylindrical, slightly tapered, a little longer than broad; chitinous wall cut out on each side leaving a basally directed point with narrow bridge. Clasper short, conical, setose with two terminal short claws. Adminiculum broad, smooth, minutely pilose; no teeth on adminiculum arms.

Prosimulium hirtipes (Fries) originally described from Europe is widespread in Europe and North America. In America it appears to be confined to the region east of the Mississippi and north of the Carolinas. There are allied species found in the West. Is is an early spring species. In the vicinity of Washington it may be found as early as March 18 and as late as May 23. *P. hirtipes* attacks man rarely and does not appear to be a severe pest to livestock. One hundred specimens at hand.

Type locality.—Unknown. Location of type unknown to us.

Distribution.—CONNECTICUT: Roxbury, May 6, 1885 (E. W. Lendewey).

DISTRICT OF COLUMBIA: Washington, April 4, 1895 (E. A. Schwarz).

LABRADOR: Hawks Harbor, July 20, 1908 (Peary's North Pole expedition).

MAINE: Mount Katahdin, 3,000 feet, August, 1902 (———).

MARYLAND: Plummers Island, April, 1915 (R. C. Shannon). Cabin John, April 28, 1912 (J. R. Malloch). South Mountains, April 12, 1916 (H. L. Parker). Forest Glen, May 23, 1915 (O. Heidemann).

MASSACHUSETTS: Melrose Highlands, April 23 (D. H. Clemons). Holyoke, April 12, 1903 (F. Knab).

NEW FOUNDLAND: Balena, June 1903 (W. Palmer).

NEW HAMPSHIRE: Berlin Falls, August 10 (———). Franconia (A. T. Slosson). Hermit Lake, White Mountains (S. H. Scudder).

New York: Wilmot, June 1–15, 1887 (J. H. Comstock). Adirondack Mountains, Mount Seward, 4,500 feet, June 22, 1901 (A. D. MacGillivray). Ithaca, May 22, 1901 (O. A. Johannsen).

Virginia: Maywood, April 21, 1916 (W. L. McAtee). Scott's Run, April 11, 1912 (W. L. McAtee). Dead Run, March 18–April 19, 1914–1916 (R. C. Shannon). Great Falls, April 3, 1922 (H. S. Barber). Vienna, April 18, 1915 (W. L. McAtee).

PROSIMULIUM EXIGENS, new species

Close to *hirtipes*. Antennae entirely blackish; third joint broader than long; antepenultimate palpal joint moderately enlarged; pile entirely pale; legs yellowish, apices of tibiae and all tarsi darkened; stem vein pale pilose.

Ovipositor: Long and stout but not reaching beyond middle of anal lobes. Lobes conical, equal or slightly exceeding the cerci, finely setose above, more coarsely so below but intergrading. Genital rod forked, each arm with a triangular chitinous expansion. (Figs. 3 and 4.)

Male hypopygium. Side pieces conical, stout, and strongly chitinized, longer than wide; chitin absent on one side (within), a small detached piece at base lying obliquely; bridge piece narrow, widening below and joining the basal prongs of the adminiculum. Clasper stout, conical, with three terminal claws. Adminiculum transverse, the center forming a projecting point, pilose, the angles strongly shouldered rounding over to the broad basal prongs. Membranous arms without hooks, granular. (Figs. 30 and 31.)

Type locality.—Moscow, Idaho.

Cotypes, two males, *allotype* female, Cat. No. 28329, U.S.N.M.

Three female specimens at hand, two males. The females are scarcely distinguished from *hirtipes;* the male structures very different.

Distribution.—Colorado: Custer County (T. D. A. Cockerell) (no male).

Idaho: Moscow Mountain June 1, 1907 (J. M. Aldrich). Moscow (J. M. Aldrich).

PROSIMULIUM PANCERASTES, new species

Near *exigens*. Differs in having the basal antennal joints yellow; the legs and the pile more deeply yellow.

Ovipositor: Essentially as in *exigens*. (Figs. 16 and 17.) The female specimen is from Lawyers Canyon, whereas the male type is

from Peck. It is not certain, therefore, that this is the true female of *pancërastes*.

Male hypopygium: Side piece conic, stout, about as wide as long, chitin absent within; bridge piece detached, forming a long bar triangularly widening outwardly and tipped by a horn; clasper narrow, angled, chitinized, the tip horn-like with three lumps on the margin. Basal prongs of adminiculum detached, forming a long curved bar on each side, its center produced, expanded outwardly and bifid (figs. 32 and 33).

Type locality.—Peck, Idaho.

Cotypes.—Two males, Cat. No. 28330, U.S.N.M.

The female is scarcely distinguishable from *hirtipes*. Sixty-nine specimens at hand.

Distribution.—ALASKA: Cape Fanshaw, June 22, 1919 (H. G. Dyar). Ketchikan, August 7, 1919 (H. G. Dyar). Seward, July 26, 1921 (J. M. Aldrich). Camp 327, Alaska Eng. Com., July 1, 1921 (J. M. Aldrich). Katmai, August, 1917 (J. S. Hine). Naknek Lake, July, 1919 (J. S. Hine). Logan, August 20, 1919 (J. S. Hine). Virgins Bay, June 26, 1899 (T. Kincaid). Kukak Bay, July 4, 1899 (T. Kincaid). Popoff Island, July 10, 1899 (T. Kincaid).

ARIZONA: Williams, June 3, 1901 (H. S. Barber).

BRITISH COLUMBIA: Prince Rupert, June 7, 1919 (H. G. Dyar). Laggan, August 16, 1906 (Dyar and Caudell). Kaslo, June 5, 1903 (H. G. Dyar).

CALIFORNIA: Gold Lake, July 20, 1916 (H. G. Dyar).

IDAHO: Peck, April 8, 1900 (J. M. Aldrich). Lawyers Canyon, June 16, 1909 (J. M. Aldrich). Sand Point, June 4, 1921 (H. G. Dyar).

MONTANA: Lake McDonald, June 22, 1921 (H. G. Dyar). Belton, June 18, 1921 (H. G. Dyar). Two Medicine River, July 27, 1921 (H. G. Dyar). Glacier Park, June 26, 1921 (H. G. Dyar).

WASHINGTON: Lake Cushman, July 5, 1920 (H. G. Dyar). Glacier, June 4, 1917 (H. G. Dyar).

WYOMING: Old Faithful, June 29, 1922 (H. G. Dyar).

YUKON TERRITORY: White Horse, June 1, 1916 (B. P. Clark). Dawson, September 8, 1912 (J. K. Jessup).

Genus EUSIMULIUM Roubaud

Eusimulium ROUBAUD, Comp. Rend. Acad. Sci. Paris, vol. 143, 1906, p. 519.

Prosimulium MALLOCH (part), U. S. Dept. Agric., Bur. Ent., Tech. Ser. No. 26, 1914, p. 14.

Prosimulium ENDERLEIN (part), Deutsch. Tierarz. Woch., Hanover, 1920; Zool. Anz., vol. 53, 1921, p. 43.

Cnephia ENDERLEIN, Deutsch. Tierarz. Woch., Hanover, 1920; Zool. Anz. vol. 53, 1921, p. 44.

Nevermannia ENDERLEIN, Deutsch. Tierarz. Woch., Hanover, 1920; Zool. Anz. vol. 53, 1921, p. 44.

Genotype.—*Simulium aureum* Fries. This species must be taken as the genotype since it was the only species mentioned under *Eusimulium* when Roubaud established the genus.

Eusimulium differs from *Prosimulium* chiefly by having the radial sector simple (i. e. R_{2+3} is absent). The pilosity of the entire length of the radial vein distinguishes it from Simulium. In other respects it is intermediate between *Prosimulium* and *Simulium*. The fore tibia is usually without silvery pollinosity and the fore tarsi are usually slender and cylindrical (*aureum* has the fore tibia somewhat silvery pilose and the fore tarsi somewhat broader). The hind basitarsus has the apical projection and the hind second tarsus has a more or less well defined dorsal incision in certain species. The abdomen is opaque, rarely subshining, the chitinous plates two to six are reduced in width and the abdominal venter is almost entirely membranous.

TABLE OF SPECIES OF EUSIMULIUM ROUBAUD

(Based on female hypopygia. *Obtusum* and *pugetense*, founded on males, omitted)

Ovipositor flaps very large, extending to tips of anal lobes . . frisoni, new species.
Ovipositor flaps small.
  Anal lobes of the female greatly reduced, the ventral areas bearing short setae.
    Anal lobes chitinized and curved -------------------------- aureum (Fries).
    Anal lobes not more chitinized than cerci.
      Ventral portion of anal lobe broad, curved, and with dense spicules along the margin ------------------------------ mexicanum (Bellardi).
      Ventral portion narrowly produced and with fine setae.
        callidum, new species.
      Ventral lobe rounded with few short tubercular setae.
        Lateral plates of genital rod without chitinized ridge.
          mutatum (Malloch).
        These plates with median chitinized ridge ------- permutatum, new race.
  Anal lobes of female moderate not modified into special shape.
    Lateral arms of the genital rod each with central tooth.
      This tooth small and irregular, the arms widely divaricate.
        This tooth single ---------------------------- dacotense, new species.
        This tooth double or irregular --------- { pecuarum (Riley). congareenarum, new species. }

This tooth larger, the arm half or more encircling genital opening.

Tooth moderate ---------- minus, new species. / clarum, new species.

Tooth large.

Mesopleural membrane with tuft of pile ---------- boreale (Malloch).

Mesopleural membrane bare ---------- canonicolum, new species.

Tooth very large, forming a lateral arm ---------- johannseni (Hart).

Lateral arms of genital rod without tooth, widely and quadrately expanded. alticolum, new species.

TABLE OF SPECIES OF EUSIMULIUM ROUBAUD

(Based on external characters)

Claws simple.

Hind tibial spurs unusually long; hind basitarsus with a prominent projection; hind second joint with a slight dorsal incision.

Eastern North America ---------- mutatum (Malloch).

Western North America ---------- permutatum, new race.

Hind tibial spurs moderate; hind basitarsus with very slight projection; the following joint without dorsal incision ---------- frisoni, new species.

Claws with basal tooth; hind tibial spurs normal; hind second tarsus with dorsal incision, except *pecuarum*.

Postnotum with brassy scales; mesonotal pile brassy, scalelike. aureum (Fries).

Postnotum without brassy scales; mesonotal pile not brassy, except *mexicanum*.

Thoracic integument yellow with silvery pollinose stripes.

Without brownish stripes ---------- ochraceum (Walker).

With brownish stripes in addition ---------- callidum, new species.

Thoracic integument not yellow.

Mesopleural membrane with tuft of pile ---------- boreale (Malloch).

Mesopleural membrane bare.

Antenna elongate, distinctly larger than fore basitarsus; integument brownish ---------- alticolum, new species.

Antenna normal, smaller than fore basitarsus.

Stem vein pale pilose.

Bluish-gray species with yellowish legs. congareenarum, new species.

Blackish species with blackish legs.

Abdominal tergites of general dark gray color (eastern United States) ---------- johannseni (Hart)

Abdominal tergites 3, 4, 5, and 6 reduced to small plates, bluish (drier regions of western United States). clarum, new species.

Stem vein dark pilose.

Hind basitarsus truncate apically, the ventral line with a small apical spur.

Stem vein dark pilose (South Dakota) -- dacotense, new species.

Stem vein pale pilose (southeastern part of United States). pecuarum (Riley).

Hind basitarsus with apical projection on inner surface.

Tergites 2, 3, 4, and 5 not greatly reduced; legs black. minus, new species.

Tergites 2, 3, 4, and 5 greatly reduced; legs bicolored. mexicanum (Bellardi).

The following are omitted from this table: *Eusimulium obtusum*, *pugetense*, and *canonicolum*.

EUSIMULIUM AUREUM (Fries)

Simulia aureus Fries, Monogr. Simul. Suec., 1824, p. 16.

The bright, brassy, scale-like body pile and the patch of brassy scales on the postnotum characterize both sexes of this species. The legs including the fore coxae are largely light yellow; the fore tarsi of the female are broadened, the fore tibia has silvery pile; the hind basitarsus has the apical projection; the second hind tarsus has the dorsal incision and the claws are provided with a dorsal tooth.

Female hypopygium. Cerci large, quadrate, transverse, setose. 9th sternites chitinized, curved, rather small, rounded, sparsely setose on the margin only. Ovipositor flaps conical, remote at tips, weakly membranous, spicular. Genital rod widely forked, each arm expanded into a plate carrying a large blunt tooth. (Fig. 44.)

No male is before us, unless the species hereinafter described as *Eusimulium obtusum* is the missing male of the form we here identify as *aureum* Fries.

Eusimulium aureum occurs commonly in Europe where it was originally described, and is recorded from North Africa. It is not known to be a blood-sucker and is rather rarely collected in North America.

Type locality.—Unknown to us, as is the present location of type.

Distribution.—Alaska: Katmai, August, 1917 (J. S. Hine). Savonoski, Nanek Lake, June, 1919 (J. S. Hine).
California: Los Angeles County (D. W. Coquillett). Palo Alto, April 11 (J. M. Aldrich).
Colorado: Boulder (T. D. A. Cockerell).

EUSIMULIUM AUREUM BRACTEATUM (Coquillett)

Simulium bracteatum Coquillett, U. S. Dept. Agr. Bur. Ent., Bull. 10, n. s., p. 69, 1899.

Simulium bracteatum Malloch, U. S. Dept. Agr. Bur. Ent., Tech. Ser. No. 26, 1914, p. 38.

Superficially similar to *aureum;* in the female hypopygium the ovipositor flaps are smaller, the ninth tergites less rounded and with a ventral point.

Male hpyopygium: Side piece large, conic, quadrate, a chitinized bridge and reëntrant arm on one side. Clasper small, angled, with stout terminal tooth. Adminiculum small, conic-pointed, hirsute, the basal prongs triangularly widening, divaricate. Adminiculum arms with a convex membrane and two large teeth, divaricate from its base. (Figs. 24, 25, and 26.)

Type locality.—Cambridge, Mass. Type in U. S. National Museum, Cat. No. 10380, U.S.N.M.

Distribution.—ILLINOIS: Elizabeth, July 7, 1917.
KANSAS: (J. M. Aldrich).
MARYLAND: Plummers Island, April 19, 1903 (H. S. Barber).
MASSACHUSETTS: Cambridge, May 31, 1869 (H. A. Hagen?).
MICHIGAN: Battle Creek (J. M. Aldrich).
NEW HAMPSHIRE: Franconia (A. T. Slosson).
SOUTH CAROLINA: Spartanburg, July 25, 1913 (A. W. Jobbins-Promeroy).

EUSIMULIUM OBTUSUM, new species

An allied species is before us, male examples only, which we have consequently been unable to place in the table.

Male hypopygium: Side piece stout conic, large chitinous ridge half the side piece, reëntrant portion oblique, lateral, clasper small and stout, but broad, with square tips, a tooth on each angle. Adminiculum with divaricate triangular basal arms, but itself broadly concave, hirsute. Adminiculum arms with two long divaricate teeth from the base of a convex strigose membrane. (Figs. 27, 28, and 29.)

Type locality.—Redlands, Calif.

Cotypes.—Two males, Cat. No. 28331, U.S.N.M.

Distribution.—CALIFORNIA: Redlands, 1914 (F. R. Cole).

This may be the male of the species we here identify with *Eusimulium aureum* (Fries) of Europe. If this be the case, *aureum* and *bracteatum* must be considered as distinct species instead of races as we here place them. We are unsupplied with sufficient material of the European form to decide whether *aureum* is the same as our western form as we here assume, or as the eastern one (*bracteatum*), or whether it is distinct from both. We retain the name *obtusum* to cover these eventualities.

EUSIMULIUM MEXICANUM (Bellardi)

Simulium mexicanum BELLARDI, Ditterlogia Messicana, Append. 6, 1861, p. 3.

A large species, showing strong relationships with *Simulium* proper. The subshining frons, yellowish basal antennal joints, yellow coxae, bicolored legs; abdominal tergites reduced to small opaque plates, the terminal tergites shining, well developed apical projection on hind basitarsus and well marked dorsal incision of hind second tarsus which characterize this species are also found in typical species of *Simulium*. In addition it should be noted that the tho-

racic pile is very short, scattered and brassy. The radius is completely pilose on the upper surface.

Cerci, broadly conical, setose. Anal lobes narrow below the cerci, broadly expanded ventrally, the ventral edge thickened and with many rows of fine hooks, the upper part of the sclerite coarsely setose. Ovipositor flaps remote at tip, large and coarse, conical, finely pilose. Forks of genital rod broadly expanded, one side a hornlike prominence. (Fig. 46.)

Two females.

Type locality.—Mexico. The present location of the type is unknown to us.

Distribution.—Mexico: Cordoba, January 30, 1908 (F. Knab).

EUSIMULIUM OCHRACEUM (Walker)

Simulium ochraceum Walker, Trans. Ent. Soc. Lond., n. ser., vol. 5, 1860, p. 332.

Front and face subperlaceous; first two antennal joints yellow, remainder black; disk of mesonotum orange, the humeri and lateral margins and scutellum bright yellow, the second paratergite (Crampton) black. A pair of silvery pollinose stripes on mesonotum. Legs entirely blackish. Basal scale present on second tarsal joint; apical projection of hind basitarsus very prominent. Claws with a subbasal tooth. Four basal abdomnal segments yellow, the fifth opaque black, remainder shininng black. Radius entirely setose. Halteres bright yellow.

Type locality.—Mexico. The type is lost.

Distribution.—Mexico: Tuxtla Gutiérrez, Chiapas (A. L. Herrera). Simejevel, Chiapas (A. L. Herrera).

EUSIMULIUM CALLIDUM, new species

Simulium ochraceum Malloch (not Walker), U. S. Dept. Agr., Bur. Ent., tech. ser. No. 26, 1914, p. 30.

A species of dominant yellowish color. A pair of median silvery pollinose stripes and a pair of sublateral brown stripes; legs largely yellow, including fore coxae; apical projection of hind basitarsus and dorsal incision of second hind tarsus well developed.

Cerci rounded quadrate, dark brown, darker than any other parts. Anal lobes somewhat narrowed below the cerci, forming a little hairy lobe between them, produced ventrally and reaching to a rounded posterior point, which is densely covered with fine short setae. Ovipositor valves conic, remote at tip, weak, the slight forks of genital rod widely expanded and angled on both sides. (Fig. 41.)

Type locality.—Cordoba, Mexico.

Type.—Female, *allotype*, female, Cat. No. 28677, U.S.N.M.

Distribution.—Mexico: Cordoba, March 16, 1908 (F. Knab).

EUSIMULIUM MUTATUM (Malloch)

Prosimulium mutatum MALLOCH, U. S. Dept. Agr., Bur. Ent., tech. ser. No. 26, 1914, p. 20.

The dark color of body and legs, the simple claws, the prominent apical projection of the hind basal tarsus, the absence of a dorsal incision on the following joint and the unusually long spurs of the hind tibiae easily identify this species.

Ovipositor: Cerci rounded quadrate, setose. Anal lobes narrow behind cerci, with a distinct setose lobe below cerci, expanded roundedly and transparent below with about 5 short spines from tubercles. Forks of genital rod quadrately expanded with short irregular teeth, evenly pale chitinized. (Figs. 34 and 35.)

One hundred and ten specimens at hand.

Type locality.—Glassboro, N. J. The type is in the U. S. National Museum, Cat. No. 15404, U.S.N.M.

Distribution.—ILLINOIS: Meredosia, May 28, 1917 (———).

INDIANA: La Fayette, May 4 (J. M. Aldrich).

MARYLAND: Plummers Island, April 16, 1915 (R. C. Shannon).

MISSOURI: St. Louis, April 6, 1904 (W. V. Warner).

NEW JERSEY: Glassboro, March 28, 1910 (C. T. Greene). Riverton, May 5, 1924 (H. C. Hallock). Pemberton, April 22, 1914 (H. B. Scammell). Iona, April 20, 1903 (———). Jamesburg, April 30, 1911 (———). Paterson, May 3 (———).

VIRGINIA: Dead Run, Fairfax County, April 11, 1914, April 23, 1915 (R. C. Shannon).

EUSIMULIUM MUTATUM PERMUTATUM, new race

Similar to *mutatum* Malloch, but in the female the forks of the genital rod have a row of ragged teeth outwardly, and the end of the plate is darkly chitinized. (Fig. 36.)

Type locality.—Prince Rupert, British Columbia.

Type.—Female, *paratypes* 5 females, Cat. No. 28332, U.S.N.M. 89 specimens before us, all females.

Distribution.—ALASKA: Camp 327, Alaska Eng. Comm. July 13, 1919 (J. M. Aldrich), Katmai, July, 1917 (J. S. Hine). Cape Fanshaw, June 22, 1919 (H. G. Dyar). Ketchikan, June 8, 1919 (H. G. Dyar). Sitka, June 16, 1899 (T. Kincaid). Virgins Bay, June 26, 1899 (T. Kincaid). Yakutat, June 21, 1899 (T. Kincaid).

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BRITISH COLUMBIA: Kaslo, April 8, 1903 (R. P. Currie). Prince Rupert, June 17, 1919 (H. G. Dyar).

CALIFORNIA: Gold Lake, Plumas County, July 19, 1916 (H. G. Dyar). Tahoe City, June 29, 1920 (H. G. Dyar).

IDAHO: Moscow Mountain, June 1, 1907 (J. M. Aldrich).

MONTANA: Missoula, July 6, 1917 (H. G. Dyar). Glacier Park, June 26–July 1, 1921 (H. G. Dyar). Belton, June 2, 1921 (H. G. Dyar). Two Medicine River, July 27, 1921 (H. G. Dyar).

WASHINGTON: Bremerton, April 29, 1924 (H. G. Dyar). Ashford, June 9, 1921 (H. G. Dyar). Hoodsport, May 3, 1924 (H. G. Dyar). Glacier, June 4, 1917 (H. G. Dyar).

WYOMING: Yellowstone Canyon, July 6, 1922 (H. G. Dyar).

EUSIMULIUM FRISONI, new species

A very distinct species characterized by simple claws; hind tibial spurs moderate; hind basitarsus with a very slight projection; the following joint rather long, nearly six times as long as broad, without a dorsal incision. In other respects similar to *mutatum* Malloch. Hypopygium: Cerci, anal lobes, and ovipositor flaps usually large. (Plate 1, fig. E).

Type locality.—Alto Pass, Ill.

Type.—Female, Cat. No. 28725, U.S.N.M.

Distribution.—Illinois, Alto Pass, May 8, 1917 (———).

Named for Theodore Frison, who has assisted our work very materially by placing at our disposal the important collection of Simuliidae of the Illinois Natural History Laboratory.

EUSIMULIUM PECUARUM (Riley)

(?) *Simulium invenustum* WALKER, List Dipt. Brit. Mus., vol. 1, 1848, p. 112.

Simulium pecuarum RILEY, Rept. Dept. Agr. 1886, p. 512.

Prosimulium pecuarum MALLOCH, U. S. Dept. Agr. Bur. Ent., tech. ser. No. 26, 1914, p. 21.

Female.—Entirely blackish; front at narrowest width scarcely more than the width of antenna, with loose pale pile; two basal joints of antenna yellowish brown, mesonotum with three faint longitudinal vittae; legs brownish; fore tarsi slender, cylindrical; claws with a basal tooth; hind basitarsus with slight projection; hind

second tarsus without dorsal incision; abdominal dorsal plates broader than long.

Hypopygium: Cerci rounded quadrate, transverse. Ninth sternite triangular normal, more heavily chitinized on its posterior border, setae absent on lower border. Ovipositor valves slight, thin. Forks of genital rod widely divaricate, expanded, each with a large irregular double or triple tooth. (Fig. 37.)

E. pecuarum has been recorded from Westville, Conn., and Iona, N. J. Specimens from the former locality are not at hand and the specimen from Iona proves to be *mutatum*. Another specimen from New Hampshire placed with *pecuarum* in the collection proves to be *P. hirtipes*. It has also been reported from Illinois. This may be *invenustum* Walker, but we have no positive information. One hundred and ninety specimens at hand.

Type localities.—Of *invenustum*.—Martins Fall, Ontario. The type is in the British Museum. The junior author examined it in August, 1925, and found it to have the characters of *pecuarum* or *dacotense*. A third species may possibly be represented, so we refrain from a positive reference.

Of *pecuarum*.—Somerset Landing, La. The type is in the U. S. National Museum, Cat. No. 772, U.S.N.M.

Distribution.—ARKANSAS: Manila (M. M. Hinesly).

LOUISIANA: Somerset Landing, April 10, 1886 (F. M. Webster). Mansura, February 24, 1910 (C. E. Wood).

MISSISSIPPI: Lake Horn, March 16–May 6, 1886 (F. M. Webster). Lake View, April 10–May 4, 1886 (F. M. Webster).

TEXAS: College Station (F. M. Webster).

Eusimulium pecuarum (Riley) for a long series of years during and following the Civil War was an unusually serious menace to livestock and even to human beings along the lower Mississippi. Great numbers of cattle and mules perished as a result of their attacks. No serious outbreaks have occurred during the past 30 to 40 years.

The late Francis M. Webster accounted for this thus: The reason for these particularly severe outbreaks and their absence in recent years is accounted for by the fact that prior to the Civil War the levees of the Mississippi were in good condition and continuous through all of the alluvial country of the lower Mississippi; but with the outbreak of the war the levees were neglected and in many cases caved in. The adjoining lands became flooded, making ideal breeding conditions for the black flies. During the war the plagues of Buffalo gnats became so great and so severe that the Cavalry

and Artillery horses of both armies were killed in numbers and in some instances every horse and mule was killed on some plantations. The gnats do not breed in the deep waters of the Mississippi itself, and as no overflows occur now there are no longer extensive breeding places, hence we have an absence of the *Simuliums*.

EUSIMULIUM CONGAREENARUM, new species

Simulium meridionale MALLOCH (part), U. S. Dept. Agr., Bur. Ent., tech. ser. No. 26, 1914, p. 50.

Female.—Thorax and head bluish gray with pale, sparse, closely appressed and somewhat scale-like pile; front moderately narrowed; antennae small, shorter than fore basitarsus, the two basal joints brownish, remainder black; legs, including fore coxae yellowish brown, apices of tibiae and tarsi darker; second hind tarsus with moderate dorsal incision; basal tooth of claws rather small; fore tarsi slender, the third and fourth joints a little flattened; dorsal plates of abdomen broad, blackish, becoming bluish gray posteriorly; sides of second tergite with large bluish gray pollinose patches clothed with short white pile. Hypopygium as in *pecuarum*. (Fig. 45.) Wing veins brownish, more yellowish basally; stem vein white pilose; length about 3 mm.; wing 2.75 mm.

This species is apparently nearest to *aureum*. The brassy scale-like pile on the thorax and postnotum of *aureum* serve to separate them.

Twenty-four specimens.

Type locality.—Congaree, S. C.

Type.—female, *paratypes* 23 females, Cat. No. 28333, U.S.N.M.

Distribution.—SOUTH CAROLINA: Congaree, March 17 and April 22, 1912 (Jennings and King).

EUSIMULIUM DACOTENSE, new species

The pile on the stem vein is dark as in *pecuarum*.

Female hypopygium: The tooth on the arm of the genital fork is single and slighter, while the arms are less expanded or more plate-like than in *pecuarum* with which it is otherwise identical. (Fig. 48.)

Male hypopygium: Side piece short conic with bridge and reëntrant piece. Clasper slender, conical, pointed at tip, with a small tooth, almost as long as side-piece but much narrower. Adminiculum very broad, full, convex, hirsute except toward the wings, the basal prongs short, pointed and directed straight basally. Adminiculum arm forming a long folded ridge with two or three large stout teeth at the prominence of the ridge on each side. Lateral chitinous plate large, conical. (Figs. 49, 50, and 51.)

Type locality.—Brookings, S. Dak.

Types.—Two males, *paratypes* three females, Cat. No. 28334, U.S.N.M.

Distribution.—SOUTH DAKOTA: Brookings (J. M. Aldrich).

EUSIMULIUM MINUS, new species

This differs from *pecuarum* by its smaller size and darker color, projection on the hind basitarsus and dorsal incision on second hind tarsus.

Female hypopygium: Cerci and anal lobes normal. Genital rod forks triangularly expanded, each with a large single tooth. (Fig. 39.) Ovipositor flaps slight.

Type locality.—Yosemite, Calif.

Type.—Female, *paratypes* 27 females, Cat. No. 28335, U.S.N.M. Fifty-nine specimens, all females, at hand.

Distribution.—ALASKA: Fairbanks, June 29, 1921 (J. M. Aldrich). Katmai, July–August, 1917 (J. S. Hine).

CALIFORNIA: Yosemite, May 15–17, 1916 (H. G. Dyar). Fallen Leaf, Lake Tahoe, June 5–10 1916 (H. G. Dyar). Clio, July 9, 1916 (H. G. Dyar).

IDAHO: Moscow (J. M. Aldrich).

MONTANA: Belton, June 19, 1921 (H. G. Dyar).

WASHINGTON: Glacier, June 4, 1917 (H. G. Dyar). Ashford, June 19, 1921 (H. G. Dyar). Olga, July 14 (J. M. Aldrich).

WYOMING: Old Faithful, Yellowstone Park, June 27, 1922 (H. G. Dyar).

EUSIMULIUM CLARUM, new species

Simulium meridionale MALLOCH (part), U. S. Dept. Agr., Bur. Ent., tech. ser., No. 26, 1914, p. 50.

Female.—Resembles *johannseni*, but differs in having smaller dorsal plates on abdomen, which are bluish gray; the pile on abdomen is sparser and tends to be more scale-like; stem vein pale pilose. Otherwise as in *minus*.

Female hypopygium as in *minus*. (Fig. 38.)

Male hypopygium. Side piece conical, longer than wide, with bridge and short reentrant piece. Clasper thick, the tip drawn out at one angle, with a small inserted tooth. Adminiculum broad, arcuate, hirsute, the dorsal prongs short, pointed, directed straight basally. Adminiculum arms a long folded ridge, the inner conjoined area as long as side piece, double, brown, the outer ridge with many large teeth in a row; side plates small, chitinized, fimbriate. (Figs. 52 and 53.)

Fifteen specimens.

Type locality.—Fresno, Calif.

Types.—Three males, *paratypes* four females, Cat. No. 28336, U.S.N.M.

Distribution.—CALIFORNIA: Fresno, March 15–May 13, 1900 (E. A. Schwarz), March 17–May 12, 1923 (M. E. Phillips).

MONTANA: Glacier Park, June 28, 1921 (H. G. Dyar).

NEVADA: Fallen, May 28 (F. C. Bishopp). Pyramid Lake, July (J. M. Aldrich).

EUSIMULIUM BOREALE (Malloch)

Prosimulium borealis MALLOCH, Rept. Can. Arctic Exp., 1913–18, vol. 3, 1918, p. 418.

A species easily characterized by the presence of a tuft of pile on the membranous part of the mesopleura (the anepisternal cleft of Crampton). Body grayish black with dense pale pile unusually long on the scutellum; fore tarsi very slightly broadened; hind basitarsus with slight projection; hind second tarsus without dorsal incision; claws with basal tooth; wing veins with dark brown pilosity. Female hypopygium similar to *minus* and *clarum*, but each arm of the genital rod bears a very large blunt tooth, the plates are wider and slightly more nearly surround the genital orifice. (Fig. 43.)

Type locality.—Woolaston Peninsula, Victoria Island. Type in the Canadian National Collection.

Three females at hand.

Distribution.—MONTANA: Two Medicine River, July 27, 1921 (H. G. Dyar).

EUSIMULIUM CANONICOLUM, new species

As in *boreale*, smaller; membrane of mesopleura without tuft of pile. Female hypopygium as in *boreale*. (Fig. 43.)

Type locality.—Yellowstone Canyon, Wyo.

Type.—Female, *paratypes* two females, Cat. No. 28337, U.S.N.M.

Distribution.—CALIFORNIA: Summit, Placer County, July 19, 1915 (H. G. Dyar). Fallen Leaf Lake, June 4, 1916 (H. G. Dyar).

COLORADO: Grand Lake, June 19, 1923 (H. G. Dyar).

IDAHO: Albion (J. M. Aldrich).

WYOMING: Yellowstone Canyon, July 1–6, 1922 (H. G. Dyar). Mammoth Hot Springs, July 14, 1922 (H. G. Dyar).

EUSIMULIUM JOHANNSENI (Hart)

Simulium johannseni HART, 27th Rept. St. Ent. Ill., 1912, p. 32.
Simulium meridionale MALLOCH (part), U. S. Dept. Agr., Bur. Ent., Tech. Ser. No. 26, 1914, p. 49.

Differs from *pecuarum* in having the stem vein white pilose; the abdomen more profusely pilose; the hind basitarsus with a slight dorsal incision. Female hypopygium: Cerci rounded quadrate, setose; anal lobes moderate, unmodified, similar to cerci. (Fig. 19.) Ovipositor valves slight, membranous. Genital rod with the forks largely surrounding the orifice each with a long oval arm in place of a tooth. (Fig. 42.)

Male.—Side piece conical quadrate, as broad as long, ridge nearly central, reëntrant angle of margin long. Clasper stout, smooth, tip obliquely truncate with rudimentary but large tooth on the angle, not so long as side piece, nearly half as thick. Adminiculum arcuate, somewhat truncate-tipped, hirsute, the basal prongs large, curved, thick, forming an arc wider than the adminiculum. Adminiculum arms with a small group of very long teeth at each outer fold, the conjoined portion inconspicuous. Lateral plates large, grooved on the margin. (Figs. 54 and 55.)

Twenty specimens at hand.

Type locality.—Havana, Ill. Type in the Illinois State Natural History Laboratory.

Distribution.—IDAHO: Kendrick, May 25, 1902 (J. M. Aldrich).
ILLINOIS: Havana, April 26–May 1, 1912 (C. A. Hart). White Heath, April 26, 1916 (———).
MASSACHUSETTS: Hyde Park, May 4, 1914 (———).
MONTANA: Great Falls, July 7, 1921 (H. G. Dyar).
ONTARIO: Waubamic, Parry Sound, June 8, 1915 (J. M. Aldrich).

EUSIMULIUM PUGETENSE, new species

Male hypopygium: Side pieces conic-quadrate, as broad as long, bridge broad, formed by basal and apical emargination of the chitin; basal reëntrant angle short but distinct. Clasper long, rather stout, uniform, the tip roundedly angled, with short obsolete but stout tooth. Adminiculum broad, arched, the center depressed, with a rounded hirsute nipple, the rest of the adminiculum smooth and platelike; basal prongs stout, tapered, incurved, much darker than the disk. Adminiculum arms with a single very long stout tooth in each fold. (Figs. 121, 122, and 123.)

Type locality.—Seattle, Wash.

Type.—Male, Cat. No. 28338, U.S.N.M.

Distribution.—WASHINGTON: Seattle (C. V. Piper).

EUSIMULIUM ALTICOLUM, new species

Female.—Entirely reddish brown; antennae large, noticeably larger than fore basitarsus; front narrow; fore tarsi slender; hind basitarsus with a prominent projection, the following joint without dorsal incision; claws with large basal tooth; pilosity of wing veins entirely reddish brown, abdominal tergites but little reduced.

Length 3 mm.; wing 3.25 mm.

Ovipositor valves short and weak; a chitinous arm before them. Cerci conical quadrate, darker than other parts; 9th sternite triangulate, unmodified; arm of genital rod three-fourths surrounding opening, roundedly angled, with quadrate terminal plates and no tooth. (Fig. 47.)

Type locality.—Sierra Madre, Mexico.

Type.—Female, Cat. No. 28339, U.S.N.M.

Distribution.—MEXICO: Headwaters of Rio Piedras Verdes, altitude 7,300 feet, Sierra Madre, Chihuahua, May 9 (or September 5?) (C. H. T. Townsend).

Genus SIMULIUM Latreille

Melusina MEIGEN. Nouvelle Classification, 1800 (nomen nudum).
Simulium LATREILLE, Hist. Nat. Ins. et Crust., vol. 3, 1802, p. 426.
Atractocera MEIGEN, Klass., vol. 1, 1804, p. 94.

Perhaps most of the generic names proposed by Enderlein under the subfamily Simuliinae are synonyms of the genus *Simulium* as it is here understood.

Genotype.—(*Culex colombaschensis* Fabricius)=*Culex reptans* Linnaeus.

Description of the genus: The radius is bare along the section between the stem vein and the forking of the radius; the radial sector is simple; the hind basitarsus has an apical projection and the second hind tarsus has a dorsal incision. The front is usually broad; the fore tibia with or without a white pollinose patch; the fore tarsi are slender or broadened; the dorsal plates of the abdomen are usually much reduced and the claws may be toothed or simple.

KEY TO THE SPECIES OF SIMULIUM, BASED ON MALE HYPOPYGIA

Adminiculum broad, membranous.
 Adminiculum divided -- **pictipes Hagen.**
 Adminiculum entire.
  Clasper angled, with pilose projection at angle ---- **hydationis, new species.**
  Clasper not angled.
   Clasper broad at tip with 3 or 4 teeth.
    Adminiculum arms with slight dentation -------- **vittatum Zetterstedt.**
    These arms with strong dentation ----------------- **decorum Walker.**

Clasper simple or with a single spine at tip.
  Adminiculum simple, arcuate.
    Adminiculum arms with 3 very large teeth on each side.
      occidentale Townsend.
    These arms with smaller, more abundant dentation.
      No projection at base of clasper.
        Teeth of adminiculum arms approximate__ notatum Adams. / venator, new species. / griseum Coquillett. / trivittatum Malloch.
        Three small teeth separated by fimbriae____ piperi, new species.
      A round projection at base of clasper______ slossonae, new species.
  Adminiculum with central cone, traversing and exceeding disk.
    virgatum Coquillett.
Adminiculum contracted, solid, tooth-shaped.
  Clasper with a spinose projection at base.
    Projection rounded__________________________________ perissum, new species.
    Projection narrow and compressed.
      Adminiculum broad, quadrate_________________ vandalicum, new species.
      Adminiculum conical, narrow___________________ jacumbae, new species.
  Clasper simple.
    Adminiculum with a central lacuna and narrow tip____ parnassum Malloch.
    Adminiculum tooth-shaped.
      Spines of adminiculum and adminiculum arms large___ arcticum Malloch.
      Spines of adminiculum and adminiculum arms small_____ venustum Say.

No males are at hand of *meridionale, hunteri, sayi, haematopotum, trivittatum, mediovittatum, bivittatum*, and *metallicum*.

KEY TO THE SPECIES OF SIMULIUM, BASED ON FEMALE HYPOPYGIA

Anal lobe broad and setose laterally.
  Anal lobe not strongly produced ventrally.
    Anal lobe rounded, unmodified, similar to the cerci.
      Anal lobe not widened ventrally, uniform.
        Forks of genital rod with large triangular widenings.
          slossonae, new species
        Forks of genital rod with small triangular widenings.
          meridionale Riley.
        Forks of genital rod with distinct tooth.
          The chitinized rod beyond tooth straight and smooth.
            occidentale Townsend.
          The part of arm beyond tooth irregularly margined.
            Tooth sharp and slender__________________ perissum, new species.
            Tooth blunt, truncate__________________________ venustum Say. / arcticum Malloch.
      Anal lobe roundedly widened ventrally, the part behind cerci narrow.
        Anal lobe with large clear expanded area with many fine setae.
          vitattum Zetterstedt.
        Anal lobe with small ventral pilose area or none.
          Tips of ovipositor sheaths approximate, dark brown, fimbriage.
            Arms of genital rod with large dark tooth expanded beyond into membrane____________________________________ decorum Walker.
            These with moderate nontruncate tooth______ parnassum Malloch.

Anal lobe heavily chitinized and modified.

Anal lobe broad below ________________ **pictipes** Hagen.

Anal lobe curved posteriorly, narrowly truncate.

Anal lobe more slender than cerci.

Arms of genital rod with short round teeth ________ **hunteri** Malloch.

These with long sharp tooth ________________ **sayi**, new species.

Anal lobe produced, as long as cerci ____________ **metallicum** Bellardi.

Anal lobe sharply produced ventrally.

Anal lobe ventrally with a clear angle.

Arms of genital rod quadrate, half surrounding genital opening, expanded with chitinized rod to tip with long tooth from its base.
haematopotum Malloch.

Arms narrow, widely expanded, extending beyond the chitinized rod, with a curved apical chitinization but no tooth ______ **mediovittatum** Knab.

Anal lobe ventrally drawn out into a long digitate process.

Anal lobe triangularly produced, not chitinized anteriorly, or weakly chitinized ________________ **bivittatum** Malloch. **notatum** Adams. **griseum** Coquillett.

Anal lobe digitately produced, more distinctly chitinized anteriorirly ________________ **trivittatum** Malloch. **venator**, new species.

Anal lobe narrow with a single row of very coarse setae, expanded below; arms of genital rod with chitinized horns at inner and outer angles and at tip; ovipositor flaps thin but long ________________ **virgatum** Coquillett.

We have no females of *hydationis*, *piperi*, *vandalicum*, and *jacumbae*.

KEY TO FEMALES OF SIMULIUM, ACCORDING TO EXTERNAL CHARACTERS

Claws with a very strong basal projection, without subbasal tooth.

Front narrow, grayish opaque; fore coxae and legs normal, entirely black; mesonotum trivittate; grayish species.
meridionale Riley; **occidentale** Townsend.

Front broad and shining black; fore coxae yellowish; legs bicolored; mesonotum very indistinctly bivittate; shining black species.
slossonae, new species.

Claws with the base but little produced, but with a subbasal tooth; legs bicolored

Frons opaque, grayish pruinose.

Fore coxae yellowish; eyes very deeply incised ________ **virgatum** Coquillett.

Fore coxae blackish; eyes moderately incised ____________ **sayi**, new species.

Frons shining black; fore coxae yellowish.

Mesonotum distinctly trivittate.

Mesonotum without pearlaceous coloring ________________ **hunteri** Malloch.

Mesonotum with distinct pearlaceous coloring _____ **metallicum** Bellardi.

Mesonotum without vittae.

Mesonotal and stem vein black pilose ________________ **parnassum** Malloch.

Mesonotal and stem vein pale pilose ________________ **arcticum** Malloch.

Claws simple, legs bicolored.

Fore coxae black; frons opaque, grayish pollinose; last 3 tergites subopaque, dusted with gray pollinosity.

Fore tibia partly yellow with a large white pollinose patch; 5 mesonotal stripes ________________________ **vittatum** Zetterstedt.

Fore tibia entirely grayish black, without white pollinostity, although white pile is present; 3 mesonotal stripes ____________ **pictipes** Hagen.

Fore coxae yellow.
  Tergites large, the fifth large and subshining like the following; frons subopaque; mesonotum with a pair of indistinct vittae___ **decorum** Walker.
  Tergites 2, 3, 4, 5, and 6 greatly reduced, the 6th yellowish with a central black spot. Frons opaque or pearlaceous.
    Mesonotum with 7 distinct stripes.
      With 3 dark stripes.
        The pale stripes pearlaceous; frons pearlaceous. **haematopotum** Malloch.
        The pale stripes silvery white; frons gray______ **trivittatum** Malloch.
      With 3 orange-colored stripes______________________ **bivittatum** Malloch.
    Mesonotum with a single stripe or none; frons grayish.
      Mesonotum with a distinct median stripe.
        Second tergite without central black spot______ **venator**, new species.
        Second tergite with a black spot______________ **mediovittatum** Knab.
      Mesonotum with an indistinct stripe or none.
        Mesonotum strongly arched______________________ **notatum** Adams.
        Mesonotum moderately arched__________________ **griseum** Coquillett.
  Tergites 3, 4, and 5 greatly reduced, opaque velvet black; remaining shining______________________ { **perissum**, new species. **venustum** Say.

The following are not placed in this table: *hydationis*, *piperi*, *vandalicum*, and *jacumbae*.

SIMULIUM PICTIPES Hagen

Simulium pictipes Hagen, Proc. Bos. Soc. Nat. Hist., vol. 20, 1879, p. 305.
Simulium innoxium Comstock, Manual for the Study of Insects, 1895, p. 452.

A close ally of *Simulium vittatum*. Differs in having three mesonotal vittae; fore tibia entirely blackish and without the pollinose area, although the pile is whitish, and the black markings of the abdomen undivided.

Female hypopygium: Cerci rounded quadrate, infuscated, setose. Anal lobe conically produced ventrally, chitinized, especially on anterior edge, finely pilose behind. Ovipositor flaps thin. membranous, rather remote, narrow; arms of genital rod widely triangular, widened outwardly, chitinized there, with a small tooth before the widening. (Figs. 60 and 61.)

Male hypopygium: Side-piece quadrate, outer apical angle produced. Clasper long, rounded, contracted centrally, without terminal spine. Adminiculum broad, membranous, pilose, cleft mesially nearly to its base. Adminiculum arms with a group of rather large but few teeth in the bends; lateral plate large. (Figs. 100, 101, and 102.)

Type localities.—Of *pictipes*, Au Sable River, N. Y. Type in the Museum of Comparative Zoology, Cambridge, Mass.
Of *innoxium*, Ithaca, N. Y., type presumably in the Cornell University collection.

Our records of *pictipes* are confined to the Eastern United States. Fifty-two specimens.

Distribution.—District of Columbia: Piney Branch, April 1, 1906 (D. H. Clemons).

Maryland: Plummers Island, April 22–August 28, 1902–05 (Schwarz and Barber).

Minnesota: St. Paul, July 22–August 15, 1901 (O. A. Johannsen).

New York: Ithaca, September 2, 1888 (L. O. Howard).

Virginia: Rosslyn, July 7–October 5, 1912 (J. R. Malloch); September 22, 1911 (Knab and Malloch). Great Falls, May 30, 1914 (A. W. Jobbins-Pomeroy).

SIMULIUM HYDATIONIS, new species

Male hypopygium: Side-piece very short conical, twice as wide as long, clasper rather long, stout, elbowed at basal third, the expansion finely pilose; tip of clasper rounded, without spine. Adminiculum broad, membranous, transverse, arched, pilose, the stili short, stout, directed basally. Arms with very fine long teeth, resembling fimbriae in the folds, the sides narrow, lateral plates large.

Type locality.—Dead Run, Va.

Type.—Male, No. 28340, U.S.N.M.

Distribution.—Virginia: Dead Run, May 21, 1914 (R. C. Shannon).

SIMULIUM VITTATUM Zetterstedt

Simulium vittatum Zetterstedt, Ins. Lappon. Dipt., 1835, p. 803.

Simulium tribulatum Lugger, 2d rept. Ent. Minn., 1896, p. 205.

Simulium glaucum Coquillett, Proc. U. S. Nat. Mus., vol. 25, 1903, p. 97.

Simulium dahlgrüni Enderlein, Deut. Tierarz. Woch. Hanover, 1921, p. 43; Zool. Anz. vol. 53, p. 45.

Frons and fore coxae dark opaque gray; thorax with five vittae; abdomen pollinose gray, with three rather indefinite dorsal rows of longitudinal black spots; fore tibia yellowish with a large patch of white pollen; claws simple. Hypopygium, cerci rounded quadrate, infuscated, setose; anal lobe broad, infuscated and sparsely setose above, slightly lobed below cerci, roundedly expanded ventrally, clear and finely pilose. Genital rod with the arms wide, slender at tip, quadrately expanded, the outer edge of the expansion chitinized and cuneiform, inner widening membranous, apical widening triangular, infuscated. (figs. 74 and 75.)

Male hypopygium: Side-piece quadrate, longer than wide, with outer basal projection. Clasper stout, truncate, with three terminal teeth; adminiculum broad, membranous, the basal arms short with irregular tips; adminiculum arms with thickened edge and group of

small teeth in bend and margin; lateral expansion large. (figs. 106. 107, and 108.)

Type localities.—Of *vittatum*, probably Lapland, exact locality and present location of type unknown to us.
Of *tribulatum*, Minnesota, exact locality in and present location of type unknown to us.
Of *glaucum*, Kansas City, Mo., type in the U. S. National Museum. Cat. No. 6184, U.S.N.M.
Of *dahlgrüni*, Greenland, type presumably in collection Enderlein.

S. vittatum attacks man and livestock freely. It is a common species in Europe and is widespread throughout North America, occurring nearly as far north as the Arctic Ocean.

Ninety-seven specimens at hand.

Distribution.—ALASKA: Yakutat, June 21, 1899 (T. Kincaid). Popoff Island, July 10, 1899 (T. Kincaid). Katmai, July, 1917 (J. S. Hine).
ARIZONA: Tempe, June 19, 1917 (J. M. Aldrich).
BRITISH COLUMBIA: Taku, July 22, 1919 (H. G. Dyar).
CALIFORNIA: Seneca, March, 1924 (F. J. Silor). Death Valley, April, 1891 (A. Koebele). Claremont (C. F. Baker). Los Angeles, July (D. W. Coquillett). Bridgeport, June 22, 1916 (H. G. Dyar). Fallen Leaf, June 4, 1916 (H. G. Dyar).
COLORADO: Pike's Peak (T. D. A. Cockerell).
GREENLAND: Taserii, August 5, 1890 (W. Lundbeck). Kr'haab, July 31, 1890 (W. Lundbeck).
IDAHO: Moscow, June 19, 1900 (J. M. Aldrich). Julietta, July 16, 1924 (J. M. Aldrich). Hagerman (J. M. Aldrich).
ILLINOIS: Algonquin, May 7, 1913 (W. M. Nason).
INDIANA: La Fayette, April 5 (J. M. Aldrich). Richmond (———).
IOWA: Davenport, May 29, 1916 (J. M. Aldrich).
LABRADOR: Fort Chimo (L. M. Turner). Hawk's Harbor, July 20, 1908 (Peary's North Pole Expedition).
MARYLAND: Forest Glen, April 19, May 10, 1914 (O. Heidemann).
MEXICO: Victoria, Tampico, December 10 (F. C. Bishopp).
MINNESOTA: Grand Rapids, August 18, 1896 (———).

Missouri: Kansas City, April 8, 1899 (C. F. Adams).

Montana: Bozeman, August 7, 1914 (———).

Nevada: Reno, October 8, 1915 (H. G. Dyar).

New York: Niagara Falls, November, 1896 (———).

North Dakota: Minot, July 15, 1921 (H. G. Dyar).

Oregon: Crater Lake, July 28, 1920 (H. G. Dyar).

South Carolina: Spartanburg, June 6–August 14, 1912 (Jennings and King). Greenville, May 15, 1912 (Jennings and King).

South Dakota: Brookings (J. M. Aldrich).

Texas: Sabinal, March 22, 1911 (F. C. Pratt).

Washington: Ritzville, July 31, September 9, 1920 (R. C. Shannon). Oroville, July 21, 1920 (H. G. Dyar).

Wyoming: Mammoth Hot Springs, July 13, 1922 (H. G. Dyar).

Yukon Territory: White Horse, June 29–July 28, 1919 (H. G. Dyar). Selkirk, June 13, 1919 (H. G. Dyar).

SIMULIUM DECORUM Walker

Simulium decorum Walker, Cat. Brit. Mus. Dipt., vol. 1, p. 112, 1848.
Simulium venustoides Hart, 27th Rept. State Ent. Ill., 1912, p. 42.
Simulium piscicidium Malloch (not Riley), U. S. Dept. Agr., Bur. Ent., Tech. Ser. No. 26, 1914, p. 46.

A rather large bluish-gray species with legs largely brownish yellow; fifth to ninth tergites of full width, subshining, bluish gray; bases of wings brownish yellow; stem vein white pilose.

Female hypopygium: Much as in *vittatum*. Anal lobe roundedly full below, chitinized and with small setae. Ovipositor flaps approximate at tip and fimbriate, rather short. Arms of genital rod widely divaricate, simple to half way; a chitinized rod and short tooth at apex with chitinization beyond joining the surface membrane (figs. 69 and 70).

Male hypopygium as in *vittatum*, rather darker, the claspers with four teeth. (Figs. 133 and 134.)

Apparently a rather rare species of wide distribution. Three specimens bear the label "biting." According to the dates it appears to be a two-brood species. Twenty-one specimens.

Type localities.—Of *decorum*, Martin Fall, Ontario. Type in the British Museum, examined by the junior author in August, 1925.

Of *venustoides*, Algonquin, Ill. Type presumably in the Illinois State Natural History Laboratory.

Distribution.—ALBERTA: Red Deer, August 2, 1918 (H. G. Dyar).

COLORADO: Boulder (T. D. A. Cockerell).

FLORIDA: (———).

ILLINOIS: Algonquin, May 3, 1895; June 6, 1908; October 17, 1894 (———).

MARYLAND: Plummer Island, April 22, 1903 (R. P. Currie); April 29, 1915 (J. C. Crawford); May 9, 1914 (R. C. Shannon); June 8, 11, 1914 (Schwarz and Shannon); June 28, 1905 (H. S. Barber); November 3, 1901 (H. S. Barber). Near Plummer Island, May 2, 1915, June 3, 1914 (R. C. Shannon).

MICHIGAN: Pine River, September 7, 1896 (H. G. Hubbard).

VIRGINIA: Dead Run, May 28, June 6–20, 1915 (R. C. Shannon).

SIMULIUM DECORUM KATMAI, new subspecies

Differs from *decorum* in having the legs largely blackish and the fifth tergite less distinctly bluish gray.

Female hypopygium: As in *decorum*, but arms of genital rod heavily chitinized outwardly, the tooth very large and broad (figs. 56 and 57).

Male as in *decorum*.

Type locality.—Katmai, Alaska.

Type.—Female, *paratypes* 2 females. Cat. No. 28341, U.S.N.M.

All of our records are from northwestern North America. 19 specimens.

Distribution.—ALASKA: Skagway, August 1, 1919 (H. G. Dyar). Katmai, July, 1919 (H. S. Hine). Ketchikan, August, 1919 (H. G. Dyar). Kukak Bay, July 4, 1899 (T. Kincaid).

YUKON TERRITORY: Carcross, July 21, 1919 (H. G. Dyar). White Horse, June 29, 1919 (H. G. Dyar). Selkirk, June 13, 1919 (H. G. Dyar).

SIMULIUM MERIDIONALE Riley

Simulium meridionale Riley, Rept. Dept. Agr., 1886, p. 513.

An examination of the old material of this species remaining in the collection discloses the fact that it contains two sets of material. Only two females are left of the original type material (described 1886). These have labels in Riley's handwriting "3982 (bred) Mc. 16, '86; type." The second set of specimens, males and females, bearing the same lot number, 3982, also bear a label giving the year 1888 (in Pergande's writing). According to the female genitalia the second series of specimens is a different species. They prove to be conspecific with specimens of the type series of *occidentale* Townsend, hence must go under this name. We have no additional material of the true *meridionale;* while the large number of specimens (210) of this particular group from all but the northeastern parts of North America agree with the *occidentale* form.

General color dark opaque gray; pile entirely pale; frons opaque gray, distinctly narrower than the width of the clypeus; legs black, including fore coxae, mesonotum trivittate; abdominal pile rather dense and conspicuous, pale; second to sixth tergites greatly reduced, opaque dark gray, the dark coloring extending outward and merging with the grayish venter; remaining tergites of nearly full width, grayish pruinose; claws with the base greatly produced, making them appear bifid; stem vein pale pilose.

Cerci rounded, quadrate, infuscated, setose; anal lobe similar, arcuate, moderate; ovipositor flaps membranous, the tips separated. Genital rod with the forks triangularly expanded beyond the middle, a very slight tooth on the outer side of the arm at the expansion. (Figs. 62 and 63.)

No males are at hand.

Type locality.—Probably Lake View, Miss. One of the two specimens marked "type (bred)" bears the date March 16, 1886, the other is undated. In the notes under No. 3892, the first entry is dated March 26, 1886; "Received from O. Lugger, Lake View, Miss.. some small larvae of *Simulium.*" More material is recorded March 31, April 3 and 6, 1886, all from the same source, and in the last entry the receipt of a bred adult is mentioned, probably one of the types before us. Type, Cat. No. 773, U.S.N.M.

SIMULIUM OCCIDENTALE Townsend

Simulium occidentale Townsend, Psyche, vol. 6, 1891, p. 107.

Simulium tamaulipense Townsend, Journ. N. Y. Ent Soc., vol. 5, 1897, p. 171.

Simulium forbesi Malloch, U. S. Dept. Agr., Bur. Ent., Tech. ser. No. 26, 1914, p. 50.

Simulium meridionale Malloch (not Riley), U. S. Dept. Agr., Bur. Ent., Tech ser. No. 26, 1914, p. 50.

Externally the species agrees in color and structure with *meridionale.* Cerci rounded quadrate, infuscated, setose. Anal lobe similar, arcuate, moderate, the ventral edge slightly chitinized and irregular. Ovipositor flaps membranous, angular, the tips separated. Genital rod with the forks at right angles, pale to middle, a long chitinous tooth from the base of a similar rod that runs to tip of arm; a triangular flap at the tip. (Figs. 63*a* and 64.)

Male hypopygium: Side-piece longer than broad, outer tip shouldered. Clasper uniform tapered, with small terminal spine. Adminiculum broad, membranous, shallowy emarginate centrally, subpilose. Adminiculum arms with 3 very large teeth on each side, with fimbriae between; lateral plate slight. (Figs. 131 and 132.)

S. occidentale, also called "cholera gnat" and "turkey gnat," is one of our commonest and widest distributed species. In former years (about 1888) it was believed to have caused the death of thousands of chickens and turkeys yearly in Virginia by giving them cholera. It bites man and livestock freely (Townsend).

Type localities.—Of *occidentale*, Rio Grande Valley, N. Mex. Present location of type unknown to us.

Of *tamaulipense*, Tamaulipas, Mexico. Present location of type unknown to us.

Of *forbesi*, Havana, Ill. Type presumably in the State Natural History Laboratory.

Two hundred and twelve specimens at hand. No material in the collection from Northeastern America, although it is reported from New York (Johannsen).

Distribution.—ALASKA: Skagway, June 4, 1919 (Harrington).

CALIFORNIA: Tahoe City, June 14, 1920 (H. G Dyar).

DISTRICT OF COLUMBIA: Washington, May 16, (F Knab).

FLORIDA: Jacksonville (T. A. Slosson).

GEORGIA: Oxford, March 29, 1915 (Wilson Gee). Myrtle, April 3, 1916 (A. A. Girault). Cornelia, May 3, 1916 (W. W. Chase).

IDAHO: Idaho Falls, July 18, 1922 (H. G. Dyar).

ILLINOIS: Havana (A. W. Jobbins-Pomeroy). Urbana, November 13, 1915 (———). Meredosia, May 28, 1917 (———). Galena, June 29. 1892 (C. A. Hart).

INDIANA: Pine Creek, May 18, 1917 (J. M. Aldrich).

KANSAS: Lawrence (J. M. Aldrich).

LOUISIANA: Friersons Mill, March 16, 1886, May 7, 1888; December 24, 1889 (G. A. Frierson). Ashwood, May 2, 1888 (F. M. Webster). Logansport, March 24, 1922 (Tucker and Jones). Baton Rouge, May 19 (T. H. Jones). Tallulah, June 2, 1922 (W. V. King). Mound, May 27, 1922 (W. V. King).

MANITOBA: Napinka, June 20, 1907 (F. Knab).

MISSISSIPPI: Natchez, May 16, 1909 (E. S. Tucker). Agricultural College, April 1897 (H. E. Weed).

MISSOURI: St. Louis, May 6, 1904 (W. V. Warner).

MONTANA: Two Medicine River, July 27, 1921 (H. G. Dyar). Rainbow Falls, July 9, 1921 (H. G. Dyar). Saco, July 10, 1921 (H. G. Dyar). Great Falls, July 6–7, 1921, (H. G. Dyar). Glasgow, July 11, 1921 (H. G. Dyar). Havre, July 10, 1921 (H. G. Dyar).

NEW MEXICO: Las Cruces, May 19 (C. H. T. Townsend).

NORTH DAKOTA: Mandan, June 16, 1922 (H. G. Dyar). Grand Forks, June 23, 1918 (———). Fargo, June 13, 1922 (H. G. Dyar).

SOUTH CAROLINA: Abbeville, March 22, 1912 (Jennings and King). Greenwood, March 15, 1912 (Jennings and King). Ninety Six, March 19, 1912 (Jennings and King). Union, May 10, 1915 (T. P. Kennedy).

TENNESSEE: Knoxville, March 25, 1912 (E. C. Cotton).

TEXAS: Liberty, March 19, 1908 (E. S. Tucker). Dallas, June 2, 1922 (F. C. Bishopp). (Belfrage.)

SIMULIUM SLOSSONAE, new species

Simulium jenningsi MALLOCH (part), U. S. Dept. Agr., Bur. Ent., Tech. Ser. No. 26, 1924, p. 42.

Agrees with *meridionale* in having the base of the claws greatly produced; also the female hypopygium shows great similarity to the *meridionale* type. Externally the females are so close in appearance to *perissum* and small specimens of *venustum* that one must rely on the structure of the claws for their separation. Body shining black; frons shining, as broad as the clypeus; fore coxae yellowish; legs bicolored; tergites before the sixth greatly reduced, opaque black, remaining tergites shining black; abdominal pile very sparse, pale; stem vein black pilose.

Cerci rounded quadrate, infuscated, setose. Anal lobe more chitinized than cerci, as dark as abdominal sclerites, narrowing ventrally and roundedly ended. Forks of genital rod weak but broad, widely roundedly triangularly expanded outwardly, the edges narrow, dark; a small blunt point present on outer margin; tip of margin waved. (Figs. 58 and 59.)

Male hypopygium: Side pieces quadrate, stout, wider than long. Clasper uniform, twice as long as side piece, with a short rounded branch near base; a tubercle at tip. Adminiculum arched, thin central area strongly protuberant, pilose, adminiculum arms with a row of dense sharp teeth on each side, mixed with fimbriae; lateral plates conical, lined. (Figs. 124 and 125.)

Type locality.—Biscayne Bay, Fla.

Type.—Male, *paratypes* 7 females, Cat. No. 28342, U.S.N.M..

Distribution.—FLORIDA: Biscayne Bay (A. T. Slosson; H. G. Hubbard).

SOUTH CAROLINA: Columbia, May 14, 1912 (Jennings and King). Congaree, Apr. 15, 1912 (Jennings and King).

SIMULIUM GRISEUM Coquillett

Simulium griseum COQUILLETT, Bull. 10, n. ser., Div. Ent., U. S. Dept. Agr., 1898, p. 69.

Thorax gray brown to grayish yellow, the median stripe very indistinct; legs yellow except the apex of hind tibia and the tarsi in part; abdomen largely yellowish with a median row of black spots on the second to sixth tergites inclusive, the chitin of the sixth tergite reduced to a roundish black spot; last three tergites grayish yellow, shining.

Female hypopygium: Cerci rounded quadrate, infuscated, sparsely setose. Anal lobe broad, pale, setae small and sparse; ventrally triangularly produced to a long sharp point. Arms of genital rod widely expanded, pale, with a long dark tooth at base of rod. (Figs. 90 and 91.)

Male hypopygium: Side pieces longer than wide, rounded quadrate. Clasper longer than side piece, tapered, flattened, a spine at tip. Adminiculum very broadly transverse, 3 times as wide as long, basal prongs stout. Adminiculum arms with long teeth mixed with short ones in the folds; lateral plate fimbriate. (Figs. 94, 95, and 96.)

Coquillett does not record the male in the description of the species, but the single male in the lot, same data, bears the type label, presumably placed there by Coquillett.

Five specimens at hand. One specimen (Pecos, N. M.) bears label "On horse."

Type locality.—Colorado, exact locality not stated. Type in U. S. National Museum, Cat. No. 10381, U.S.N.M.

Distribution.—COLORADO: (C. P. Gillette).
NEW MEXICO: Pecos, June 28, 1905? (M. Grabham).

SIMULIUM NOTATUM Adams

Simulium notatum ADAMS, Kans. Univ. Sci. Bull., vol. 2, 1904, p. 434.

A very small species usually pale yellow with a remarkably arched mesonotum; legs almost entirely yellow except the dark fore tarsi; antennae almost entirely yellow. Female hypopygium. Cerci rounded, weakly infuscated. Anal lobe very pale, a sharp projection below cerci, drawn out ventrally to an angular point which is finely hirsute. Genital rod as in *griseum* but weakly chitinized. (Figs. 88 and 89.)

Male hypopygium. Side pieces quadrate, a little longer than broad; clasper tapered, uniform, moderate, a spine at tip. Adminiculum broad, arched, membranous, basal prongs short and slender. Adminiculum arms with a long row of long and short teeth, lateral expansion weak but rather large. (Figs. 117 and 118.)

Four specimens.

Type locality.—Williams Fork, Ariz. Type presumably in the collection of the University of Kansas.

Distribution.—NEW MEXICO: Las Cruces, June 25, 1895 (T. D. A. Cockerell).
TEXAS: Devil's River, May 6, 1907 (F. C. Pratt).

SIMULIUM VENATOR, new species

Mesonotum entirely light pollinose except for a distinct brownish median stripe, scutellum yellowish; tergites 3, 4, 5, and 6 with central black spots; legs mostly yellowish. Female hypopygium. As in *distinctum*, but the ventral process of the ninth segment is shorter, being less than the length of the body of the sclerite. (Figs. 92 and 93.)

Male hypopygium as in *distinctum*.

Type locality.—Reno, Nev.

Type.—Female, *allotype* male, *paratypes* 13 females, Cat. No. 28343, U.S.N.M.

Distribution.—CALIFORNIA: Inyo County (A. Davidson).
IDAHO: Idaho Falls, July 18, 1922 (H. G. Dyar). Moscow, June 16, 1910 (J. M. Aldrich).
MONTANA: Great Falls, July 7, 1921 (H. G. Dyar).
NEVADA: Reno, July 7, 1916 (H. G. Dyar). Steamboat, September 3, 1915 (H. G. Dyar).

SIMULIUM MEDIOVITTATUM Knab

Simulium mediovittatum KNAB, Ins. Ins. Mens., vol. 3, 1916, p. 77.

Very close to *venator*, but of a general darker color, the scutellum blackish, legs more extensively black, second tergite with a central black spot.

Female hypopygium exactly as in *haematopotum*.

Thirteen specimens at hand.

Type locality.—Arlington, Tex. Type in U. S. National Museum, Cat. No. 19635, U.S.N.M.

Distribution.—TEXAS: Arlington, October 28, 1914 (F. C. Bishopp). Bay City, January 26, 1911 (C. T. Atkinson).

SIMULIUM BIVITTATUM Malloch

Simulium bivittatum MALLOCH, U. S. Dept. Agr., Bur. Ent., Tech. Ser. No. 26, 1914, p. 31.

The mesonotum shows seven distinct stripes including the pale lateral which are alternating pale pollinose and orange colored.

Female hypopygium as in *notatum* exactly.

Ten specimens at hand.

Type locality.—East Las Vegas, N. Mex. Type in U. S. National Museum, Cat. No. 15415, U.S.N.M.

Distribution.—COLORADO: Virginia Dale, September 31, 1912 (F. C. Bishopp). August 17, 1906 (———).
MONTANA: Great Falls, July 7, 1921 (H. G. Dyar).
NEW MEXICO: East Las Vegas, June 1, 1901 (T. D. A. Cockerell). Las Vegas Hot Springs, August 19, 1901 (H. S. Barber).

SIMULIUM TRIVITTATUM Malloch

Simulium trivittatum MALLOCH, U. S. Dept. Agr., Bur. Ent., Tech. Ser. No. 26, 1914, p. 30.

Simulium distinctum MALLOCH, U. S. Dept. Agr., Bur. Ent., Tech. Ser. No. 26, 1914, p. 30.

The seven stripes of the mesonotum are alternating pale pollinose and black, the stripes of nearly equal width.

Female hypopygium. Cerci infuscated, sparsely setose, anal lobe roundly produced, with a long fringe-shaped ventral process, finely pilose at tip; anterior margin of segment infuscated. Eighth sternite plate dark and coarsely setose. Genital rod dark, the arms pale, triangularly widened, a chitinized rod beyond with a tooth from its base. (Figs. 78 and 79.) Male hypopygium as in *notatum*. (Figs. 115 and 116.)

Seven specimens at hand.

Type localities.—Of *trivittatum*, Tampico, Mexico. Type in the U. S. National Museum, Cat. No. 15408. U.S.N.M.

Of *distinctum*, Devils River, Texas. Type in U. S. National Museum, Cat. No. 15958, U.S.N.M.

Distribution.—MEXICO: Tampico, December 17 (E. A. Schwarz).

TEXAS: Devils River, May 5, 1907 (Bishopp and Pratt). Victoria, December 13 (F. C. Bishopp).

SIMULIUM HAEMATOPOTUM Malloch

Simulium haematopotum MALLOCH, U. S. Dept Agr., Bur. Ent., Tech. Ser. No. 26, 1914, p. 62.

This species is easily characterized by the pearlaceous mesonotal color, alternating with black stripes. The lateral pair are rather broad and not sharply separated from the black stripes. The mesonotal pile is brassy and the frons and clypeus pearlaceous.

Female hypopygium. Cerci rounded quadrate, infuscated, setose. Anal lobe rather small, infuscated, very sparsely setose, some coarse. The ventral area produced with a small round point with fine pile. A dorsal chitinized plate. Ovipositor flaps weak, but marked on their inner angles with dark fimbriate lines; eighth segment heavily chitinized, coarsely setose. Genital rod as in the foregoing (figs. 86 and 87) (*notatum* and others).

Thirteen specimens.

Type locality.—Vera Cruz, Mexico. Type in U. S. National Museum, Cat. No. 15414, U.S.N.M.

Distribution.—CUBA: Cayamas, January 6 (E. A. Schwarz).

GUATEMALA: Polochic River, March 22, 1906 (H. S. Barber).

MEXICO: Santa Lucrecia, October, 1911 (F. W. Urich). Chiapa de Corzo, October, 1925 (A. L. Herrera).

PORTO RICO: Rio Piedras, January 24, 1912 (T. H. Jones).

SIMULIUM PIPERI, new species

Male.—Entirely black, including legs; anterior half of mesonotum faintly and diffusely pale pollinose; thoracic pile brassy; scutellum fringed with black hairs; stem vein black pilose.

Hypopygium: Side pieces quadrate, short; clasper thick at base, excavately tapered, twice as long as side piece, a spine at tip. Adminiculum broad, arched, pilose, the basal prongs stout, rather

long. black; adminiculum arms with three long sharp teeth on each side. well spaced, with one or two little teeth and fimbriae between; a thin spotted membrane. (Figs. 129 and 130.)

Type locality.—Seattle, Wash.

Type.—Cat. No. 28344, U.S.N.M.

Distribution.—WASHINGTON: Seattle (C. V. Piper).

SIMULIUM VIRGATUM Coquillett

Simulium virgatum COQUILLETT, Proc. U. S. Nat. Mus., vol. 25, 1903, p. 87.

Simulium hippovorum MALLOCH, U. S. Dept. Agr., Bur. Ent., Tech. Ser. No. 26, 1914, p. 28.

Simulium rubicundulum KNAB, Ins. Ins. Mens., vol. 2, 1914, p. 178.

A fairly large species; fore coxae yellow, frons grayish opaque; eyes deeply incised; tergites two to six, very small; last three bluish gray, faintly obscured with pollen; fore tibia with a distinct patch of white pollen; fore tarsi slightly thickened, legs mostly yellow; mesonotum with tinge of reddish brown. Mesopleura usually bare but sometimes with a few loose hairs on upper margin.

Female hypopygium with anal lobe narrow, and a single row of coarse setae; forks of genital rod shaped like a spear-head, heavily chitinized and broad, both teeth dark as well as the curved tips. (Figs. 82 and 83.)

Male hypopygium: Side pieces short, outer angle produced. Claspers heavy and broad, rounded, constricted subapically with terminal minute tubercle; adminiculum broad, membranous, with wide basal arms, the center quadrately produced to form an I-shaped bar which crosses the disk and widens at base. Adminiculum arms ridged, subdentate, with a spotted membrane. (Figs. 126, 127, and 128.)

Fifty specimens at hand.

Type localities.—Of *virgatum*, Las Vegas Hot Springs, N. Mex. Type in U. S. National Museum, Cat. No. 6183, U.S.N.M.

Of *hippovorum*, Sierra Madre, Mexico. Type in U. S. National Museum, Cat. No. 15407, U.S.N.M.

Of *rubicundulum*, Cordoba, Mexico. Type in U. S. National Museum, Cat. No. 19112, U.S.N.M.

Distribution.—CALIFORNIA: Los Angeles, June–July (W. D. Coquillett). Fresno, May 12, 1923 (M. E. Phillips). East Highlands, October, 1914 (———). Clio, July 9, 1916 (H. G. Dyar). Truckee, August, 8, 1915 (H. G. Dyar).

Mexico: Sierra Madre, Chihuahua, July 27 (C. H. T. Townsend). Cordoba, December 17, 1907 (F. Knab).

New Mexico: Las Vegas, July 8–August 14, 1901 (H. S. Barber).

South Dakota: Hot Springs (———).

Texas: Devils River, May 5, 1907 (F. C. Pratt).

SIMULIUM HUNTERI Malloch

Simulium hunteri Malloch, U. S. Dept. Agr., Bur. Ent., Ser., No. 26, 1914, p. 59.

A fairly large species, fore coxae yellow; frons shining; eyes less conspicuously incised than in *virgatum;* three distinct mesonotal vittae; fore tibia with whitish pollinose patch; fore tarsi broadened; last four tergites shining black. Ovipositor: Similar to *pictipes.* Anal lobe curved posteriorly, truncate tipped, chitinized before, infuscated behind. Arms of genital rod with rounded dark tooth centrally, the apex broadly expanded and darkly colored. (Figs. 71 and 72.)

No male. A widely distributed western species. The type series bear the label "On cow." Twenty-eight specimens.

Type locality.—Virginia Dale, Colo. Type in U. S. National Museum, Cat. No. 15415, U.S.N.M.

Distribution.—Alaska: Seward, July 25, 1921 (J. M. Aldrich).

British Columbia: Ainsworth, July 11, 1903 (A. N. Caudell). Glenora (H. F. Wichkam). Laggan, August, 1906 (Dyar and Caudell). Kwinitsa, August 14, 1919 (H. G. Dyar).

Colorado: Virginia Dale, September 31, 1912 (F. C. Bishopp).

New Mexico: Beulah, August 15 (T. D. A. Cockerell). Havey's Ranch, 10,000 feet, August 28, 1916 (C. H. T. Townsend).

SIMULIUM SAYI, new species

Simulium hunteri Malloch (part), U. S. Dept. Agr., Bur. Ent., Tech. Ser. No. 26, p. 59.

A medium-sized species distinguished from others of the group by the dark coxae; grayish opaque frons; dark legs, the basal parts of mid and hind basitarsi and basal parts of hind second tarsus yellowish; no pollinose patch on the fore tibia and slender fore tarsi; last four tergites shining. *S. hunteri* has the fore coxae yellow, the frons shining, the fore tibia with a pollinose patch and the fore tarsi broadened. Female hypopygium: Similar to *hunteri;*

anal lobe more pointed ventrally, more evenly infuscated, the arm of the genital rod with a long sharp tooth centrally. (Figs. 67 and 68.)

Three females taken "on cow."

Type locality.—Virginia Dale, Colo.

Type.—Female, *paratypes* two females, Cat. No. 28345, U.S.N.M.

Distribution.—COLORADO: Virginia Dale, September 31, 1912 (F. C. Bishopp).

SIMULIUM METALLICUM Bellardi

Simulium metallicum BELLARDI, Saggio Ditter. Mess., vol. 1, 1859, p. 14.

A rather small species easily distinguished by its pearlaceous mesonotum with 3 distinct vittae; parallel sided, shining black frons; pearlaceous clypeus; yellow coxae; bicolored legs and toothed claws.

Female hypopygium: Cerci rounded quadrate, infuscated, setose, anal lobe with a dorsal plate; sclerites ventrally rounded, triangular, more heavily chitinized than cerci, setose, curved back, truncate tipped, equaling the cerci. Arms of genital rod with chitinization and smaller tooth outwardly. (Figs. 72*a* and 73.)

No males. Thirty specimens.

Type locality.—Mexico, exact locality unknown. The type may be in Florence, Italy.

Distribution.—COSTA RICA: San José (F. Knab).
GUATEMALA: Cacao, Trece Aguas, March 27, (H. S. Barber).
MEXICO: Nogales (C. H. T. Townsend). Cordoba, December 21, 1907 (F. Knab).
TRINIDAD: Mendoza, August 24, 1908 (F. W. Urich).

SIMULIUM PARNASSUM Malloch

Simulium parnassum MALLOCH, U. S. Dept. Agr., Bur. Ent., Tech. Ser. No. 26, 1914, p. 36.

A medium sized blackish species with shining frons, yellowish coxae; fore tibia with scarcely a trace of the white pollinose patch: claws toothed; mesonotum and stem vein black pilose. Hypopygium exactly as in *arcticum* Malloch. (Figs. 65 and 66.) Male hypopygium. Sidepieces short, shouldered at an acute angle. Clasper stout, uniform, twice as long as sidepiece, a spine at tip. Adminiculum with large oblique basal arms from an elliptical lacuna, the tip narrow, overlined by a triangular membrane with long hirsute tip. Adminiculum arms strongly margined with several long teeth in the folds mixed with numerous fimbriae; lateral plates large, fimbriate. (Figs. 103, 104, and 105.)

This species attacks man freely. Thirty-five specimens.

Type locality.—Red Hill, Moultonburgh, N. H. Type in U. S. National Museum, Cat. No. 15409, U.S.N.M.

Distribution.—MARYLAND: Plummers Island, May 9, 1914 (R. C. Shannon); June 8, 1914 (Schwarz and Shannon).

NEW HAMPSHIRE: Red Hill, August 5, 1902 (H. G. Dyar). White Mountains (H. K. Morrison).

NEW YORK: Plattsburg, August 18, 1904 (H. G. Dyar).

VIRGINIA: Skyland, July 19, 1912 (H. G. Dyar). Dead Run, May 23, 1915 (R. C. Shannon).

SIMULIUM ARCTICUM Malloch

Simulium arcticum MALLOCH, U. S. Dept. Agr., Bur. Ent., Tech. Ser. No. 26, 1917, p. 37.

Simulium hunteri MALLOCH (part), U. S. Dept. Agr., Bur. Ent., Tech. Ser. No. 26, 1914, p. 59.

Simulium simile MALLOCH, Canad. Arctic Exp., 1913–1918, vol. 3, 1919. p. 42c.

Simulium simile CAMERON, Dom. Canada, Dept. Agr., Bull. No. 5, n. ser. 1922.

A species of variable size with pale pilosity, two large pale pollinose spots connected with a median one on anterior mesonotum; shining frons; yellowish coxae; bicolored legs with a very distinct patch of silvery pollen on fore tibia. Hypopygium as in *venustum*. but anal lobe broadly rounded below and bluntly pointed, finely pilose; chitinized in spots; arms of genital rod with a very large truncate tooth centrally. (Figs. 80 and 81.)

Male hypopygium as in *venustum* but head of adminiculum more coarsely spinose, teeth of adminiculum arms few, long, and widely spaced, only in the angles; lateral plates large, fimbriate. (Figs. 109 and 110.)

An abundant species in the Northwest. Cameron has recently reported it (as *simile*) as a severe pest to cattle in the Saskatchewan region and gives an extended account of its morphology and biology with figures. It is also an exceedingly annoying species to man. Two hundred and forty specimens.

Type localities.—Of *arcticum*, Kaslo, British Columbia. Type in U. S. National Museum, Cat. No. 15410, U.S.N.M.

Of *simile*, Arctic Sound, Canada. Type in the Canadian National Collection.

Distribution.—ALASKA: Camp 327, Alaska Eng. Com. July 12, 1921 (J. M. Aldrich). Healy, July 7, 1921 (J. M. Aldrich).

ALBERTA: Banff, July 13, 1918 (H. G. Dyar).

British Columbia: Kaslo, July 4, 1903 (R. P. Currie). Lake Atlin, July 27, 1919 (H. G. Dyar). Kokanee Mountain, August 10, 1903 (H. G. Dyar). London Hill Mine, July 21, 1903 (R. P. Currie). Lilloet (2302). Hazelton, September 5, 1919 (H. G. Dyar).

California: Clio, July 9, 1916 (H. G. Dyar). Fallen Leaf, June 4, 1916 (H. G. Dyar). Gold Lake, July 19, 1916 (H. G. Dyar).

Colorado: Virginia Dale, September 31, 1912 (F. C. Bishopp). Fraser River, June 26, 1923 (H. G. Dyar). Peetz, July 13, 1921 (G. A. Sandhouse).

Idaho: Moscow, April 8, 1913 (J. M. Aldrich). Marsh (J. M. Aldrich). Albion (J. M. Aldrich). Lahwai, March 27, 1909 (J. M. Aldrich). Gospel Mountain, July 12, 1907 (J. M. Aldrich).

Montana: Great Falls, July 7, 1921 (H. G. Dyar). Rainbow Falls, July 9, 1921 (H. G. Dyar). Belton, June 19, 1921 (H. G. Dyar). Cut Bank, July 5, 1921 (H. G. Dyar).

Nevada: Reno, October 8, 1915 (W. R. Munroe).

Oregon: Detroit, May 20, 1924 (H. G. Dyar).

Saskatchewan: Rothern, June 1, 1915, (W. R. Munroe).

Washington: Glacier, June 4, 1917 (H. G. Dyar), Longmire Springs, August 2, 1905 (J. M. Aldrich). Ritzville, July, 1920 (R. C. Shannon). Yakima, December, 1919, larvae and pupae (J. M. Aldrich).

Wyoming: Old Faithful, June 29, 1922 (H. G. Dyar).

Yukon Territory: Selkirk, June 13, 1919 (H. G. Dyar). Dawson, September 8, 1912 (J. M. Jessup).

SIMULIUM PERISSUM, new species

Simulium jenningsi, Malloch (part), U. S. Dept. Agr., Bur. Ent., Tech. Ser. No. 26, 1914, p. 42.

A medium sized species, very close to *venustum* and very difficult to separate from the typical form. It is somewhat darker, with evidence of three mesonotal vittae; the stem vein is black pilose. Cerci rounded quadrate, infuscated, setose, anal lobe unmodified, setose, with rather broad median chitinized area. Ovipositor flaps weak, remote at tips, slightly embrowned in inner margins. Forks of

genital rod moderate, a long tooth from the base of marginal chitinization that runs to apex. (Figs. 84 and 85.)

Male hypopygium. Side piece wider than long, setose only at outer rim, clasper twice as long as side piece, with a short rounded spinose arm near base; a spine at tip. Adminiculum transverse quadrate, heavily chitinized on margins and long basal prongs. margin emarginate, denticulate. Adminiculum arms with a row of close teeth mixed with fimbriae; lateral plates moderate. (Figs. 119 and 120.) The male hypopygium is very similar to that of the European *S. tuberosum* Lundstrom, except for the spines on the lobe of side piece.

Near *slossonae*, the arms of the claspers spinose instead of pilose, the adminiculum more chitinized and quadrate.

Type locality.—Dead Run, Fairfax County, Va.

Type.—Male, *paratypes* thirteen males and females, Cat. No. 28346, U.S.N.M.

The larvae and pupae live in the swift waters of Dead Run stream just where it begins its descent over a precipitous rocky hillside.

Thirty-five specimens.

Distribution.—MARYLAND: Forest Glen, May 18, 1914 (O. Heidemann). Plummers Island, June 5, 1903 (W. V. Warner).

SOUTH CAROLINA: Gramlin, August 20, 1912 (Jennings and King). Columbia, May 14, 1912 (Jennings and King). Ninety Six, April 19 (Jennings and King).

VIRGINIA: Dead Run, Fairfax County, April, 1925 (R. C. Shannon).

SIMULIUM VANDALICUM, new species

Male hypopygium: As in *perissum*, but the basal branch of the clasper is reduced to a narrow, heavily spinose ridge. (Figs. 111 and 112.) Females from the same locality and collecting are indistinguishable from *venustum*.

Eleven specimens.

Type locality.—Fallen Leaf, Calif.

Type.—Male, *paratypes* 6 females, Cat. No. 28347, U.S.N.M.

Distribution.—CALIFORNIA: Fallen Leaf, June 28, 1916 (H. G. Dyar), July 17, 1917 (———). Lake Tahoe, June 13, 1920 (H. G. Dyar). Summit, Placer County, July 19, 1915 (H. G. Dyar). Lily Lake, June 8, 1916 (H. G. Dyar).

SIMULIUM JACUMBAE, new species

Male hypopygium: Side piece short, wider than long, oblique, a long basal projection outwardly. Clasper very long, curved, flat-

tened, a spine at tip, a small compressed spinose projection at base. Adminiculum conic, rounded, smooth, heavily chitinized, the large basal prongs oblique, resembling a bishop's hat. Adminiculum arms with close spines at the outfolds, mixed with fimbriae; lateral plates large, lined. (Figs. 113 and 114.)

Type locality.—Jacumba Springs, Calif.

Type.—Cat. No. 28348, U.S.N.M.

Distribution.—CALIFORNIA: Jacumba Springs (E. A. McGregor).

SIMULIUM VENUSTUM Say

Simulium venustum SAY, Journ. Acad. Sci. Phila., vol. 3, 1829, p. 28.
Simulium piscicidium RILEY, Amer. Ent., vol. 2, 1870, p. 367.
Simulium molestum HARRIS, Insec. Inj. to Veg., ed. 3, 1862, p. 601.
Simulium irritatum LUGGER, 2d Rept. Ent. Minn., 1896, p. 177.
Simulium minutum LUGGER, 2d Rept. Ent. Minn., 1896, p. 177.
Simulium jenningsi MALLOCH (part), U. S. Dept. Agr., Bur. Ent., Tech. Ser. No. 26, 1914, p. 41.
Simulium rileyana ENDERLEIN, Konowia, vol. 1, 1922, p. 75.
Simulium reptans IMMS (not Linnaeus), Text Book of Entomology, 1925, p. 625.

A variable species in size, small to rather large, and variable in coloring. Frons shining, as broad as clypeus; fore coxae yellowish; legs bicolored, the tibiae with distinct silvery pollinose patches; fore tarsi broadened; claws simple; tergites, six to nine, shining; preceding ones opaque black with greatly reduced tergites. The form described as *jenningsi* Malloch has the sides of the mesonotum distinctly pearlaceous.

Femle hypopygium: Cerci rounded quadrate, infuscated, setose, ninth segment rather broad, uniformly chitinized centrally, setose, the ventral area slightly truncately produced and with fine seta. Arms of genital rod divaricate, thickened outwardly, and forming irregular dentation of two or three truncate or blunt teeth. (Figs. 76 and 77.)

Male hypopygium: Side piece rounded quadrate, wider than long. Clasper twice as long as side piece, thick, rounded, a little constricted outwardly, with sharp terminal spine. Adminiculum short, square, with minute denticles at tip, the basal prongs divaricate, thick, truncate tipped. Adminiculum arms with many long teeth mixed with fimbriae, lateral plates quadrate, produced at one angle. (Figs. 97, 98, and 99.)

Extremely abundant throughout North America, probably extending into the Arctic Circle. In California, two closely allied species *candalicum* and *jacumbae* take its place. In some regions it is exceedingly annoying to man and animals. Nearly a thousand specimens at hand. Closely allied to the European *reptans* Linnaeus, but distinct on details of the hypopygium of both sexes.

It appears that Riley's material of *piscicidium* was mixed (No. 390), his adults being *venustum*, but the larvae *decorum*.

Type localities.—Of *venustum*, Shippingsport, Ohio. The type is lost.

Of *piscicidium*, Mumford, New York. Type in U. S. National Museum, Cat. No. 771, U.S.N.M.

Of *molestum*, probably Massachusetts. The type may be in the collection of the Boston Society of Natural History.

Of *minutum*, Minnesota; exact locality and location of type unknown to us.

Of *jenningsi*, Plummers Island, Maryland. Type in U. S. National Museum, Cat. No. 15412, U.S.N.M.

Of *rileyana*, Long Lake, New York. Type presumably in collection Enderlein.

Distribution.—Alaska: Ketchikan, August 6, 1919 (H. G. Dyar). Metlakahtla, May 6, 1899 (T. Kincaid). Popoff Island, July 9, 1899 (T. Kincaid). Seward, July 25, 1921 (J. M. Aldrich). Camp 327, July 31, 1921 (J. M. Aldrich).

Alberta: Medicine Hat, October, 1911 (J. R. Malloch).

British Columbia: Prince Rupert, August 16, 1919 (H. G. Dyar). Lake Atlin, July 26, 1919 (H. G. Dyar). Bear Lake, July 20, 1903 (R. P. Currie).

Colorado: Tennessee Pass, July 23, 1917 (J. M. Aldrich).

Florida: Biscayne Bay (A. T. Slosson); May 9–29, (H. G. Hubbard).

Idaho: Moscow, July 2, 1912 (J. M. Aldrich). Gospel Mountains, July 12, 1907 (J. M. Aldrich). Lewiston, June 1, 1904 (J. M. Aldrich).

Illinois: Algonquin, May 18, 1913 (Q. A. Nason). Dubois, April 24, 1914 (———). Urbana, May 6, 1916 (———). White Heath, May 8, 1915 (———).

Indiana: LaFayette, October 14 (J. M. Aldrich).

Iowa: Davenport, May 29, 1916 (J. M. Aldrich).

Louisiana: Friersons Mills, May 6, 1889 (J. A. Frierson).

Maryland: Plummers Island, May 23, 1914 (R. C. Shannon). Forest Glen, May 18, 1914 (O. Heidemann). Chevy Chase Lake, July 4, 1907

(F. Knab). Beltsville, September 26, 1911 (F. Knab). Cabin John, May 16, 1909 (F. Knab).

MASSACHUSETTS: Wilbraham, June 4, 1903 (F. Knab).

MICHIGAN: Battle Creek (J. M. Aldrich).

MISSISSIPPI: Lake View, April 10, 1886 (C. V. Riley).

MISSOURI: St. Louis, May 6, 1904 (W. V. Warner).

MONTANA: Two Medicine River, July 27, 1921 (H. G. Dyar).

NEW HAMPSHIRE: Franconia (A. T. Slosson). White Mountains (H. K. Morrison).

NEW JERSEY: Ramsey, July 30, 1912 (J. R. Malloch). New Lisbon, May 25, 1924 (C. H. Halloch).

NEW YORK: Ithaca (———). Plattsburg, August 2–11, 1904 (H. G. Dyar). Axton, June 12–22, 1907 (A. D. Mac Gillivray). Moody, August 11, 1904 (H. G. Dyar).

NORTH CAROLINA: Flat Rock, June 6, 1912 (A. H. Jennings).

ONTARIO: Waubamic, June 4, 1915 (J. M. Aldrich). White River, June 26, 1907 (F. Knab). Pine River, September 7, 1896 (H. G. Hubbard).

SASKATCHEWAN: Oxbow, May 18, 1907 (F. Knab). Saskatoon, September 16, 1919 (H. G. Dyar).

SOUTH CAROLINA: Spartanburg, July 19, 1913 (A. W. Jobbins-Pomeroy). Abbeville, March 2, 1912 (Jennings and King). Congaree, March 17, 1912 (Jennings and King). Inman, August 9, 1912 (A. H. Jennings). Columbia, May 20, 1912 (Jennings and King). Greenwood, October 9, 1912 (Jennings and King). Gramtin, August 20, 1912 (Jennings and King). Anderson, May 17, 1912 (Jennings and King).

TEXAS: September, 1873 (A. H. R. Bryant).

VIRGINIA: Appomatox, August 11, 1910 (G. A. Runner). Dead Run, March 27, 1925 (R. C. Shannon). Falls Church, June 2, 1914 (O. Heideman). Chain Bridge, July 20, 1912 (F. Knab). Black Pond, October 3, 1924 (H. S. Barber). Spring Hill, September 21, 1911 (F. Knab). Great Falls, June 10, 1910 (E. W. Wall).

WASHINGTON: Spokane, July 2, 1917 (H. G. Dyar). Glacier, June 4, 1917 (H. G. Dyar).

WEST VIRGINIA: White Sulphur Springs, October 25, 1915 (F. Knab).

WYOMING: Yellowstone Canyon, July 5, 1922 (H. G. Dyar). Old Faithful, June 27, 1922 (H. G. Dyar).

YUKON TERRITORY: White Horse, July 1, 1919 (H. G. Dyar). Carcross, July 21, 1919 (H. G. Dyar).

EXPLANATION OF FIGURES

PLATE 1

A. *Prosimilium hirtipes.* Male genitalia, ventral view.
B. *Prosimilium hirtipes.* Female genitalia, lateral view.
C. *Simulium venustum.* Male genitalia, ventral view.
D. *Simulium venustum.* Male genitalia, viewed from caudal aspect.
E. *Eusimulium frisoni.* *a.* Genital fork; *b.* terminal organs.
F. *Parasimulium furcatum.* Wing.
G. *Simulium* Wing.

PLATE 2

FIG. 1. *Prosimulium magnum* Dyar and Shannon, female ovipositor.
2. The same, genital rod.
3. *Prosimulium exigens* Dyar and Shannon, female ovipositor.
4. The same, genital rod.
5. *Prosimulium dicum* Dyar and Shannon, female ovipositor.
6. The same, genital rod.
7. *Prosimulium dicentum* Dyar and Shannon, female ovipositor.
8. The same, genital rod.
9. *Prosimulium fulvum* Coquillett, female ovipositor.
10. *Prosimulium onychodactylum* Dyar and Shannon, female ovipositor.
11. The same, genital rod.
12. *Prosimulium hirtipes* Fries, female ovipositor.
13. The same, genital rod.

PLATE 3

FIG. 14. *Prosimulium novum* Dyar and Shannon, female ovipositor.
15. The same, genital rod.
16. *Prosimulium pancerastes* Dyar and Shannon, female ovipositor.
17. The same, genital rod.
18. *Prosimulium pleurale* Malloch, genital rod.
19. *Eusimulium johannseni* (Hart), female ninth segment and cerci.
20. *Prosimulium fulvum* Coquillett, male clasper.
21. The same, male adminiculum.
22. *Prosimulium magnum* Dyar and Shannon, male clasper.
23. The same, male adminiculum.
24. *Eusimulium bracteatum* (Coquillett), male clasper.
25. The same, male adminiculum.
26. The same, male adminiculum arms.

27. *Eusimulium obtusum* Dyar and Shannon, male clasper.
28. The same, male adminiculum.
29. The same, male adminiculum arms.
30. *Prosimulium exigens* Dyar and Shannon, male clasper.
31. The same, male adminiculum.
32. *Prosimulium pancerastes* Dyar and Shannon, male clasper.
33. The same, male adminiculum.

PLATE 4

FIG. 34. *Eusimulium mutatum* (Malloch), female ovipositor.
35. The same, genital rod.
36. *Eusimulium permutatum* Dyar and Shannon, female genital rod.
37. *Eusimulium pecuarum* (Riley), female genital rod.
38. *Eusimulium clarum* Dyar and Shannon, female genital rod.
39. *Eusimulium minus* Dyar and Shannon, female genital rod.
40. *Eusimulium canonicolum* Dyar and Shannon, female genital rod.
41. *Eusimulium ochraceum* (Walker), female genital rod.
42. *Eusimulium johannseni* (Hart), female genital rod.
43. *Eusimulium boreale* (Malloch), female genital rod.
44. *Eusimulium aureum* (Fries), female genital rod.
45. *Eusimulium congareenarum* Dyar and Shannon, female genital rod.
46. *Eusimulium mexicanum* (Bellardi), female genital rod.
47. *Eusimulium alticolum* Dyar and Shannon, female genital rod.
48. *Eusimulium dacotense* Dyar and Shannon, female genital rod.
49. The same, male clasper.
50. The same, male adminiculum.
51. The same, male adminiculum arms.
52. *Eusimulium clarum* Dyar and Shannon, male clasper.
53. The same, male adminiculum and arms.
54. *Eusimulium johannseni* (Hart), male clasper.
55. The same, male adminiculum (above) and arms (below).

PLATE 5

FIG. 56. *Simulium katmai* Dyar and Shannon, female ninth segment and cerci.
57. The same, genital rod.
58. *Simulium slossonae* Dyar and Shannon, female ninth segment and cerci.
59. The same, genital rod.
60. *Simulium pictipes* Hagen, female ninth segment and cerci.
61. The same, genital rod.
62. *Simulium meridionale* Riley, female ninth segment and cerci.
63. The same, genital rod.
63*a*. *Simulium occidentale* Townsend, female ovipositor.
64. The same, genital rod.
65. *Simulium parnassum* Malloch, female ninth segment and cerci.
66. The same, genital rod.
67. *Simulium sayi* Dyar and Shannon, female ninth segment and cerci.
68. The same, genital rod.
69. *Simulium decorum* Walker, female ninth segment and cerci.
70. The same, genital rod.
71. *Simulium hunteri* Malloch, female ninth segment and cerci.
72. The same, genital rod.
72*a*. *Simulium metallicum* Bellardi, female ninth segment and cerci.

73. The same, genital rod.
74. *Simulium vittatum* Zetterstedt, female ninth segment and cerci.
75. The same, genital rod.

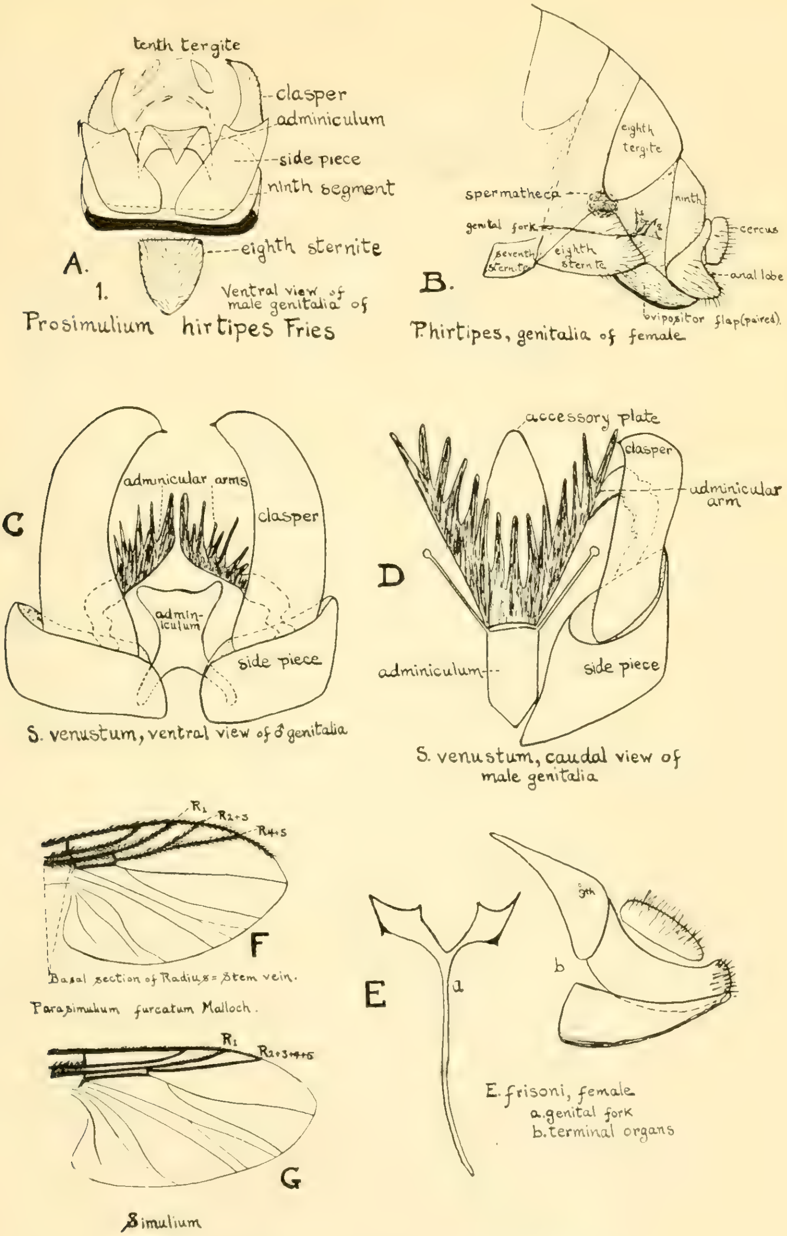
PLATE 6

76. *Simulium venustum* Say, female ninth segment and cerci.
77. The same, genital rod.
78. *Simulium trivittatum* Malloch, female ninth segment and cerci.
79. The same, genital rod.
80. *Simulium arcticum* Malloch, female ninth segment and cerci.
81. The same, genital rod.
82. *Simulium virgatum* Coquillett, female ovipositor.
83. The same, genital rod.
84. *Simulium perissum* Dyar and Shannon, female ninth segment and cerci.
85. The same, genital rod.
86. *Simulium haematopotum* Malloch, female ninth segment and cerci.
87. The same, genital rod.
88. *Simulium notatum* Adams, female ninth segment and cerci.
89. The same, genital rod.
90. *Simulium griseum* Coquillett, female ninth segment and cerci.
91. The same, genital rod.
92. *Simulium venator* Dyar and Shannon, female ninth segment and cerci.
93. The same, genital rod.
94. *Simulium griseum* Coquillett, male clasper.
95. The same, male adminiculum.
96. The same, male adminiculum arms.
97. *Simulium venustum* Say, male clasper.
98. The same, male adminiculum.
99. The same, male adminiculum arms.
100. *Simulium pictipes* Hagen, male clasper.
101. The same, male adminiculum.
102. The same, male adminiculum arms.
103. *Simulium parnassum* Malloch, male clasper.
104. The same, male adminiculum.
105. The same, male adminiculum.

PLATE 7

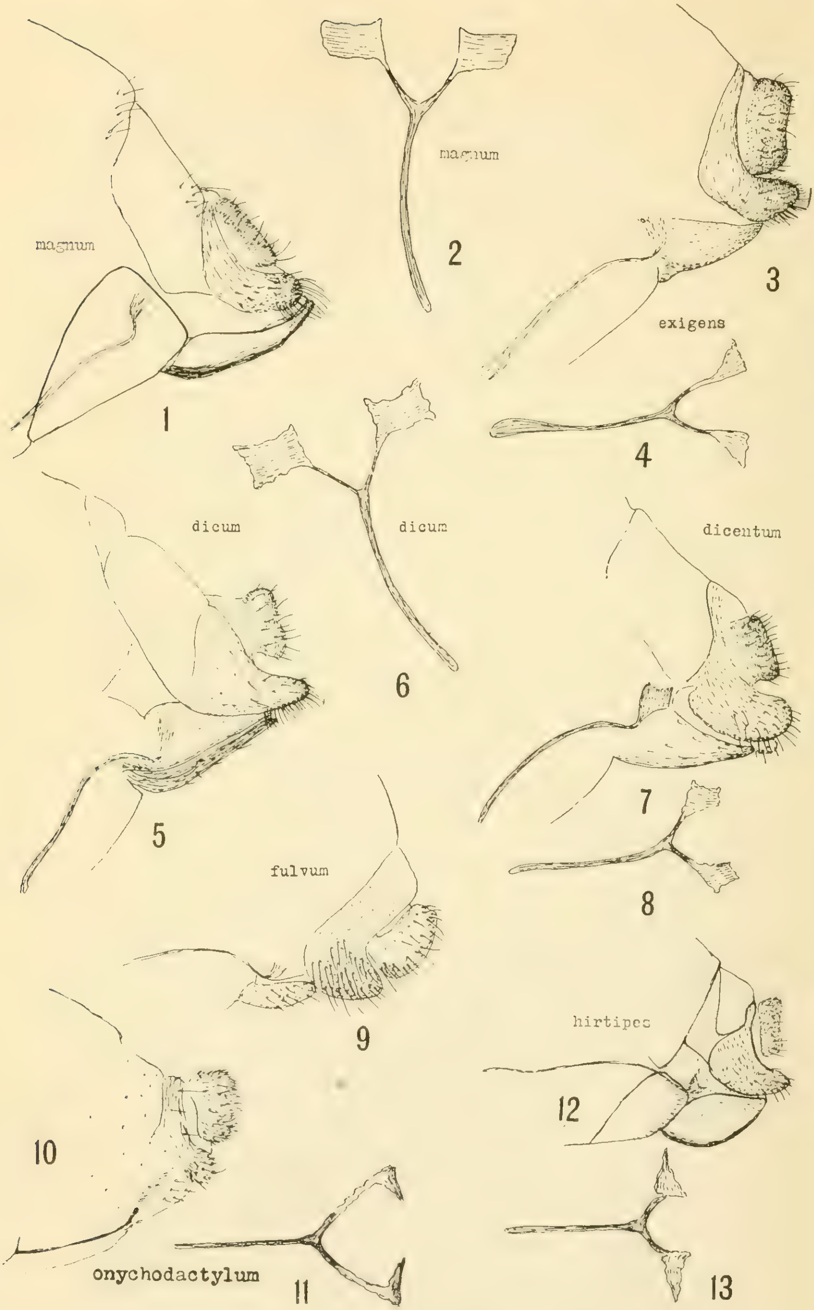
106. *Simulium vittatum* Zetterstedt, male clasper.
107. The same. male adminiculum.
108. The same, male adminiculum arms.
109. *Simulium arcticum* Malloch, male clasper.
110. The same, male adminiculum and arms.
111. *Simulium vandalicum* Dyar and Shannon, male clasper.
112. The same, male adminiculum and arms.
113. *Simulium jacumbae* Dyar and Shannon, male clasper
114. The same, male adminiculum (above) and arms (below).
115. *Simulium trivittatum* Malloch, male clasper.
116. The same, male adminiculum and arms.
117. *Simulium notatum* Adams, male clasper.
118. The same, male adminiculum and arms.
119. *Simulium perissum* Dyar and Shannon, male clasper.

120. The same, male adminiculum and arms.
121. *Eusimulium pugetense* Dyar and Shannon, male clasper.
122. The same, male adminiculum.
123. The same, male adminiculum arms.
124. *Simulium slossonae* Dyar and Shannon, male clasper.
125. The same, male adminiculum and arms.
126. *Simulium virgatum* Coquillett, male clasper.
127. The same, male adminiculum.
128. The same, male adminiculum arms.
129. *Simulium piperi* Dyar and Shannon, male clasper.
130. The same, male adminiculum (below) and arms (above).
131. *Simulium occidentale* Townsend, male clasper.
132. The same, male adminiculum and arms.
133. *Simulium decorum* Walker, male clasper.
134. The same, male adminiculum and arms.



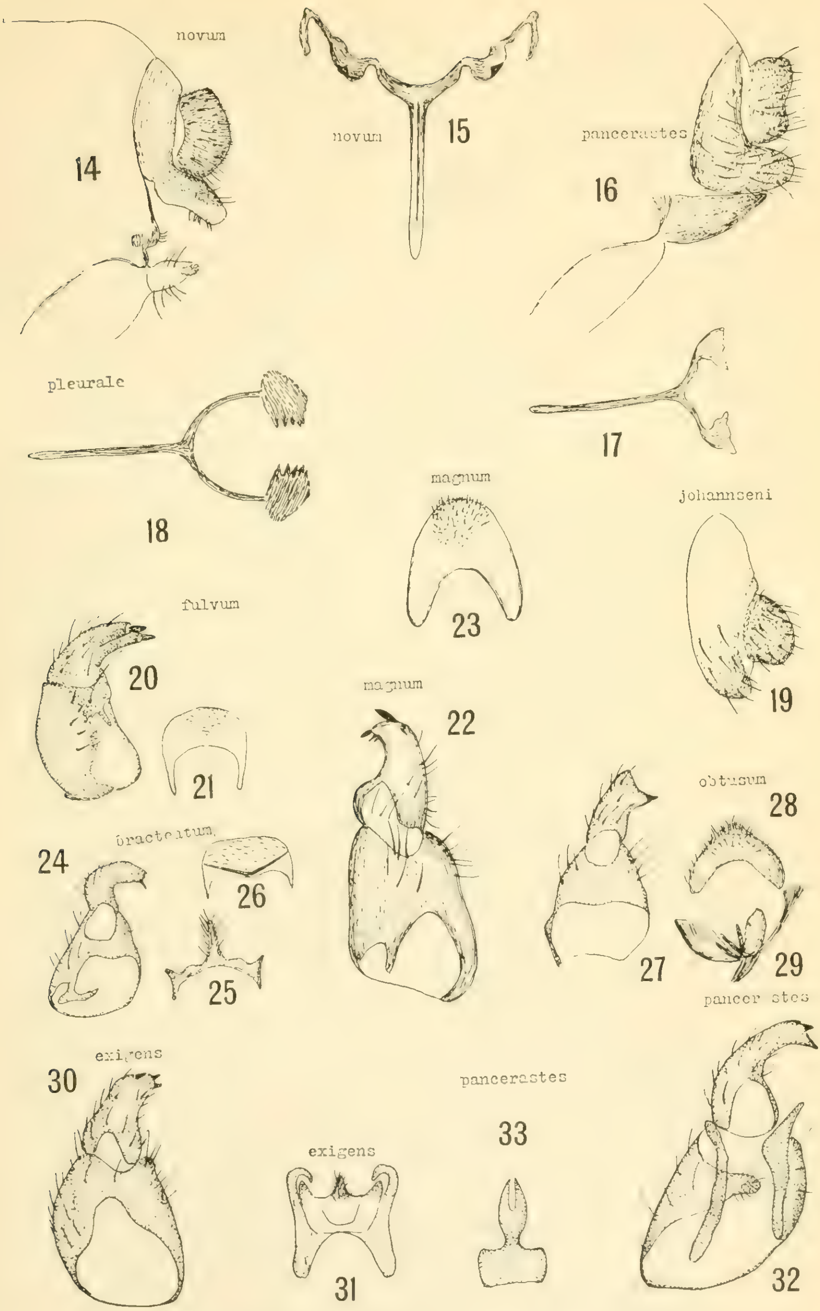
TWO-WINGED FLIES OF THE FAMILY SIMULIIDAE

FOR EXPLANATION OF PLATE SEE PAGE 48



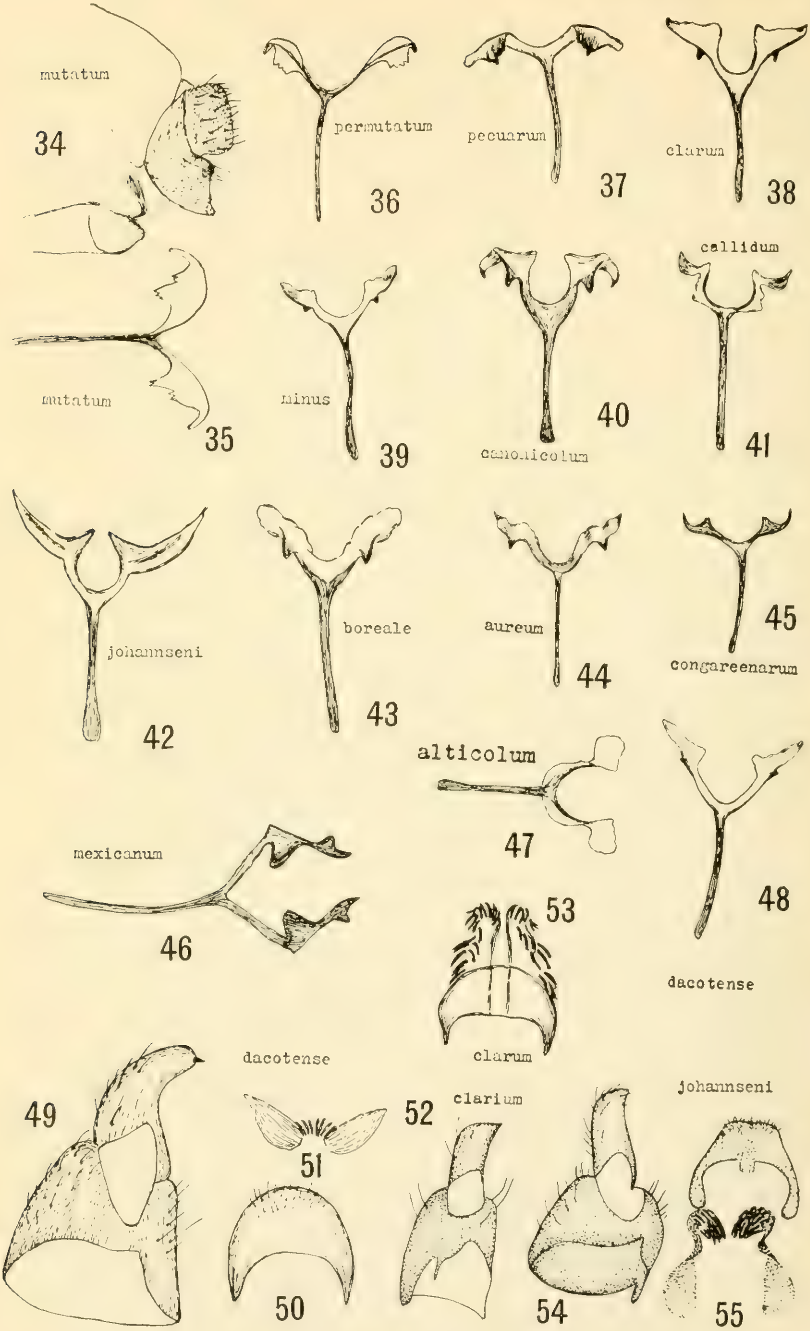
TWO-WINGED FLIES OF THE FAMILY SIMULIIDAE

FOR EXPLANATION OF PLATE SEE PAGE 48



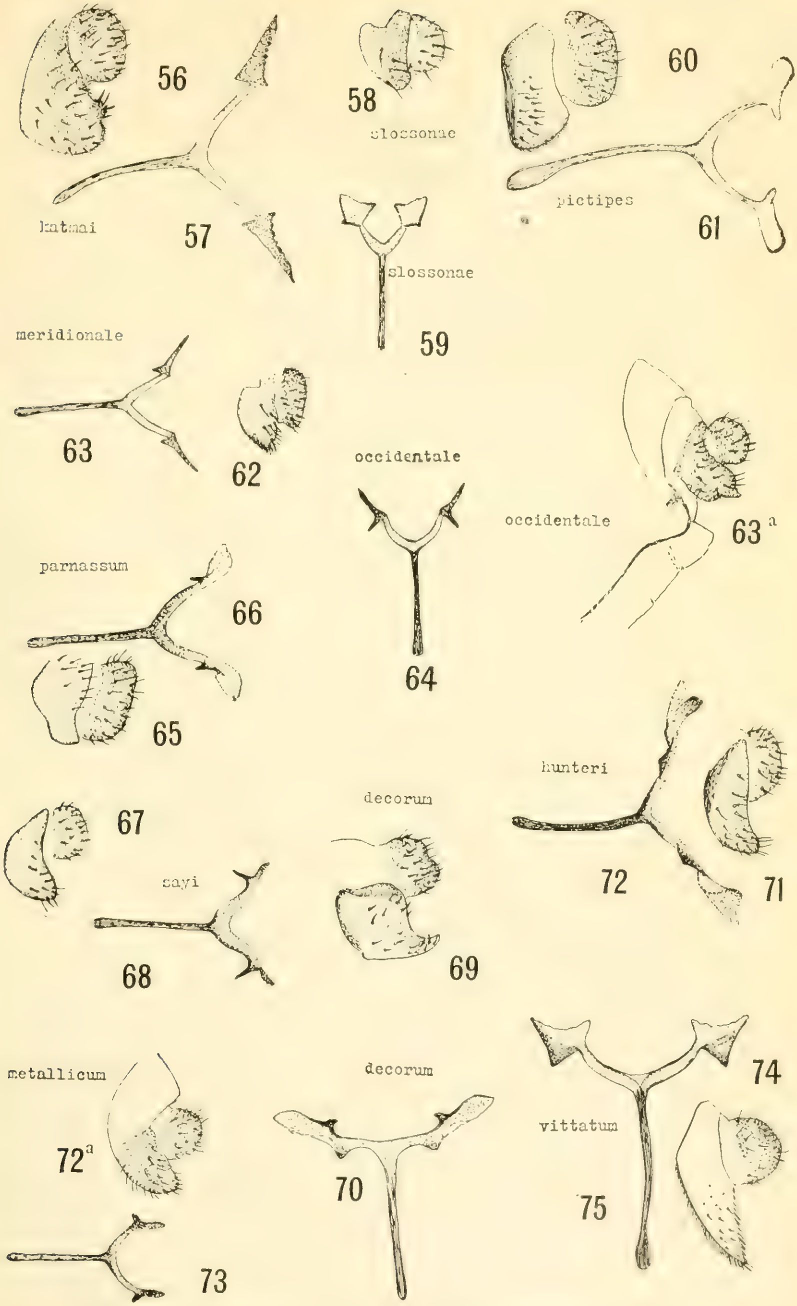
TWO-WINGED FLIES OF THE FAMILY SIMULIIDAE

FOR EXPLANATION OF PLATE SEE PAGES 48 AND 49



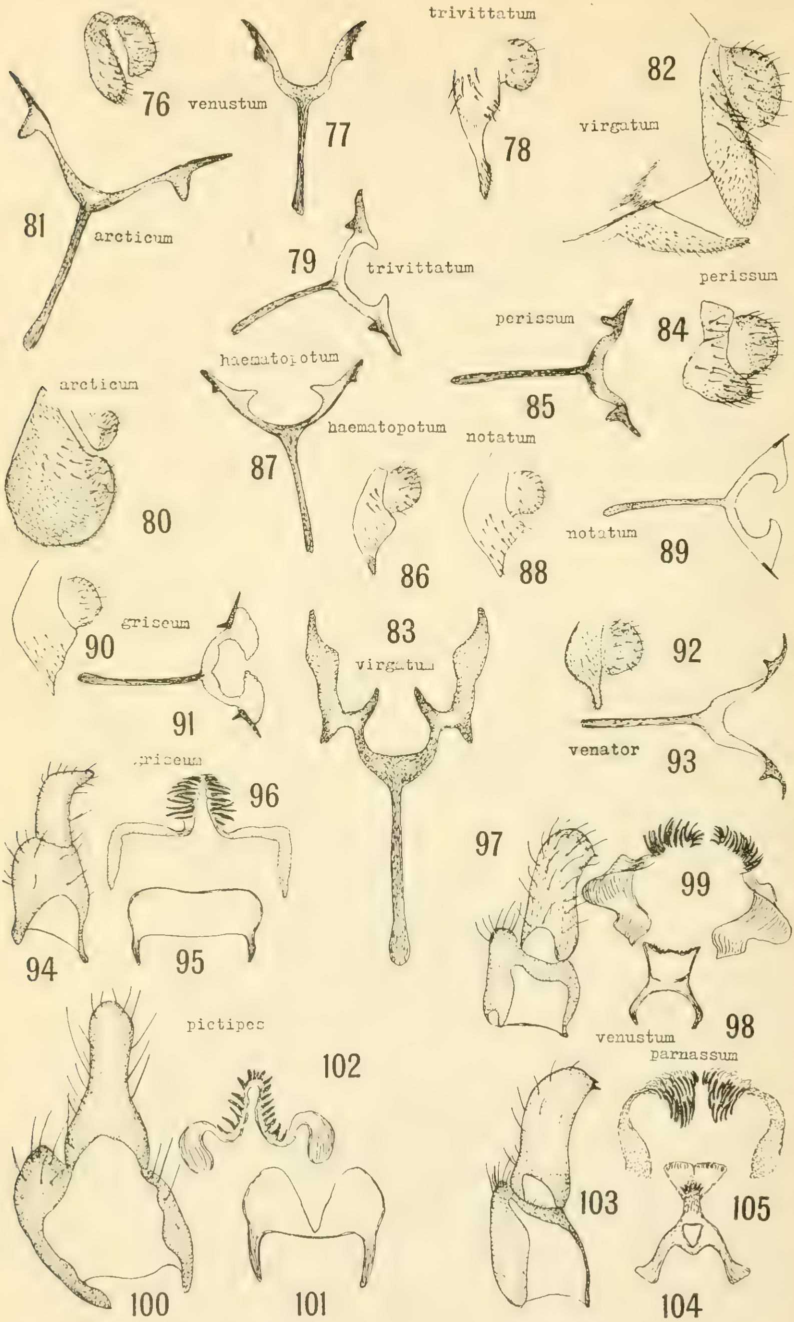
Two-Winged Flies of the Family Simuliidae

For explanation of plate see page 49



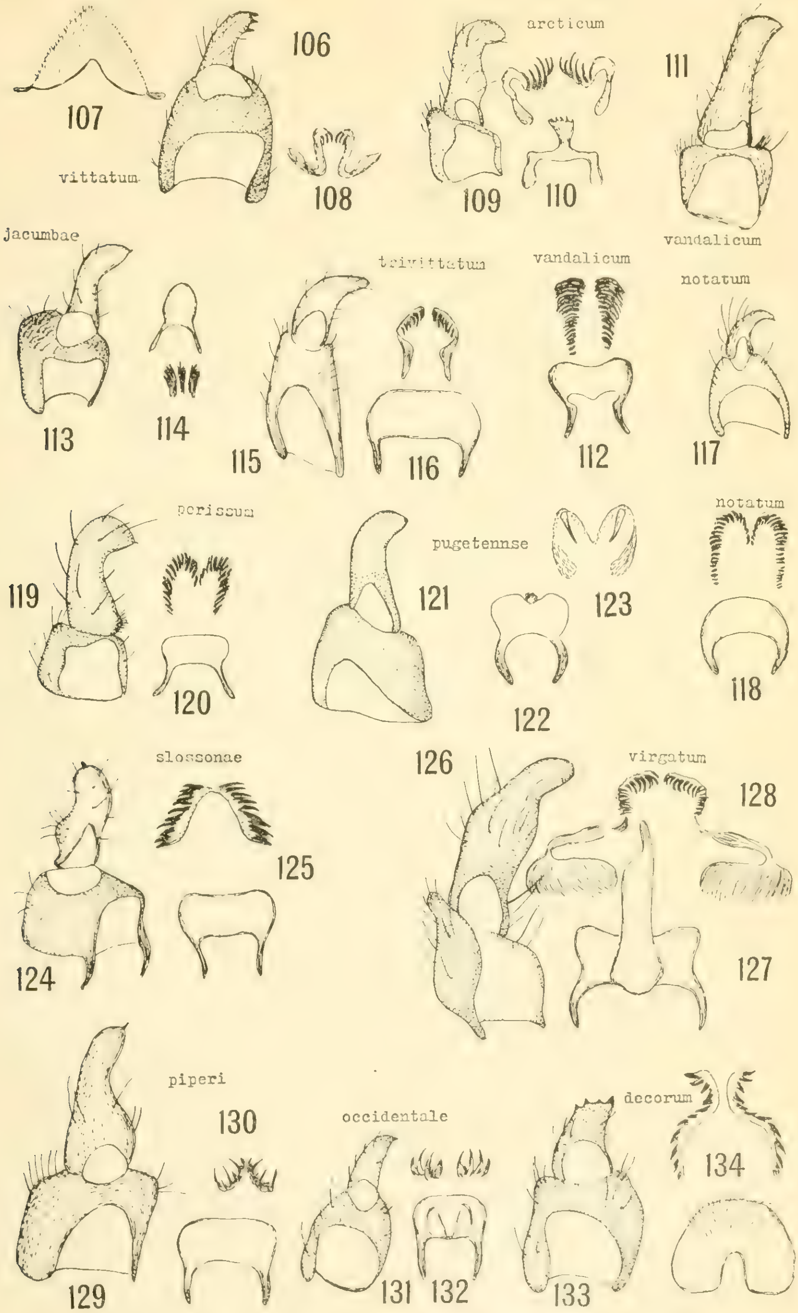
TWO-WINGED FLIES OF THE FAMILY SIMULIIDAE

FOR EXPLANATION OF PLATE SEE PAGES 49 AND 50



Two-Winged Flies of the Family Simuliidae

For explanation of plate see page 50



TWO-WINGED FLIES OF THE FAMILY SIMULIIDAE

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Accepted genera are in boldfaced type, species in roman, and synonyms in italics.

THE CHRYSOTOXINE SYRPHID-FLIES

By Raymond C. Shannon
Of the Bureau of Entomology, United States Department of Agriculture

The material belonging to the genus *Chrysotoxum* at my disposal. mainly that in the National Collection, has permitted a fairly complete review of the American species and a partial review of the European fauna, the results of which are here given. Notes on the types of *derivatum* Walker and *villosulum* Bigot, the material recorded in the Biologia Centralia-Americana (all in the British Museum), and the material recorded by Giglio Tos in the "Ditteri del Messico" (in the Natural History Museum in Turin, Italy) are likewise included. I have had also the use of paratype material of *perplexum* Johnson and *plumeum* Johnson, and have obtained certain European species through an exchange with Prof. J. Hervé-Bazin.

I wish to thank Maj. E. E. Austen for permission to examine the material in the British Museum and F. W. Edwards for subsequently examining and making notes on the types; Dr. A. Borelli for permission to examine the material at the museum in Turin; Prof. J. Hervé-Bazin for the exchange of material; and C. W. Johnson for the paratypes noted above.

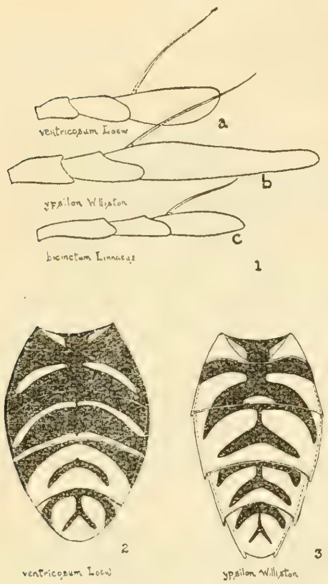
References to the literature of the genus have been largely limited to the original citations, to the new synonymy, and to Mr. Curran's recent review of the group.[1]

The species of the genus *Chrysotoxum* are fairly large, wasplike flies of a very distinctive appearance. The genus belongs to the subfamily Syrphinae. It is easily distinguished by the elongate antenna with dorsal arista, the marginated sides of the abdomen and the wasplike body markings. The species in this genus, for the most part, are very uniform in structure and color and are separated with difficulty. All of the material at hand, American and exotic, was studied in order to work out the relative value of the characters within the genus. The genus may be divided into two subgenera on

[1] Can. Ent., vol. 56, 1924, pp. 34–40.

the basis of antennal characters. One, typified by *bicinctum* (Linnaeus), genotype of *Chrysotoxum*, has the first and second antennal joints greatly elongate, the two combined being much longer than the third, or the arista. This appears to be the dominant group in Europe and also occurs in Asia, but no species are known from America. The second subgenus, *Primochrysotoxum*, new subgenus (type, *ypsilon* Williston), has the first and second joints but little elongate, their combined length approximating the length of the third and frequently being much shorter. The entire length of the antenna is often much shorter than the length of the fore tarsus. The specific character which appears to be of most importance in the subgenus *Primochrysotoxum* is found in the apical corners of the second, third, and fourth tergites. In one group of species they are projecting and in the remaining species the corners are confluent with the side margins of the abdomen. In the former group the females usually have the apical corners of the fifth tergite likewise projecting. Also in the first group the third antennal joint is usually about three times the length of the first, whereas in the second group it is about twice the length of the first.

The male genitalia are very uniform in most species of the genus. Two species, at least, are notable exceptions, namely, *cautum* Harris (Europe) and *tuberculatum*, new species (China). In the latter the styles are asymmetrical, but this asymmetry is of a different type from that which characterizes the members of the subfamily Sericomyinae.



FIGS. 1–3.—1, INNER VIEW OF THE ANTENNA TO SHOW RELATIVE LENGTH OF JOINTS OF: *a*. CHRYSOTOXUM (PRIMOCHRYSOTOXUM) VENTRICOSUM LOEW, *b*. CHRYSOTOXUM (PRIMOCHRYSOTOXUM) YPSILON WILLISTON, *c*. CHRYSOTOXUM (CHRYSOTOXUM) BICINICTUM LINNAEUS. 2, ABDOMEN OF CHRYSOTOXUM (PRIMOCHRYSOTOXUM) VENTRICOSUM LOEW, FEMALE, SHOWING THE EVEN OUTLINE. 3. ABDOMEN OF CHRYSOTOXUM (PRIMOCHRYSOTOXUM) YPSILON WILLISTON, FEMALE, SHOWING THE PROJECTION OF THE APICAL CORNERS OF THE TERGITES

Abnormal development of the abdominal segments appears to be unusually frequent in members of this genus. A large number of specimens examined had one or another segment more or less doubled by the presence of an additional rudimentary segment.

The species of *Chrysotoxum* are chiefly Holarctic in distribution. They are very partial to woodlands and are usually found on the forested slopes of mountains. A few species are known from tropical

countries, but these probably occur only in high altitudes. One species recorded here from India (*ladakense*, new species) was taken at an altitude of 16,000 feet. Very little is known of their immature stages. A pupa of *pubescens* has been found under a stone.

KEY TO THE SPECIES OF CHRYSOTOXUM IN THE NATIONAL COLLECTION

A[1]. Arista as long as, or longer than, combined length of first and second antennal joints (fig. 1*a* and 1*b*)______________Subgenus **Primochrysotoxum.**

B[1]. American species.

C[1]. Apical corners of tergites not projecting (fig. 2); outline of abdomen evenly rounded (best viewed from below); third sternite with yellow markings extending upon anterior margin in *coloradense* and sometimes in *derivatum;* antenna shorter than fore tarsus; fifth tergite much broader than long.

D[1]. Second sternite black except sometimes on anterior margin; pteropleura usually with black pile; frons of male black pilose; anterior bands on tergites 2 and 3 interrupted in middle and separated from side margins_____**ventricosum** Loew.

D[2]. Second sternite with hind margin yellow; pteropleura and frons of male yellow pilose.

E[1]. Anterior bands on tergites 2 and 3 interrupted in middle and separated from side margins__**chinook,** new species.

E[2]. Anterior bands on tergites 2 and 3 entire and attaining side margins______________________**coloradense** Greene.

C[2]. Apical corners of tergites 2, 3, and 4, and usually the fifth in the female, distinctly projecting (fig. 3); antenna as long as, or longer than, fore tarsus; fifth tergite about as long as broad.

D[1]. Abdominal margins beyond middle of second tergite yellow.

E[1]. Sternites 3 and 4, and in female the fifth, with yellow only on hind margins; anterior bands on tergites 3 and 4 entire________________________________**aztec,** new species.

E[2]. Sternites 3 and 4, and in female the fifth, each with a pair of large yellow spots at the middle; anterior bands on tergites 3 and 4 interrupted.

F[1]. First tergite and anterior corners of second black pilose; apices of fore coxae with black hairs. **occidentale** Curran.

F[2]. First and second tergites yellow pilose, sometimes with a few black hairs; apices of fore coxae with yellow hairs __________________________**ypsilon** Williston.

D[2]. Lateral margins of tergites 2 to 5 alternating black and yellow.

E[1]. Pteropleura with black pile; no yellow spot above fore coxa; arcuate abdominal bands interrupted.

F[1]. Second antennal joint shorter that the first; length of joints, 1 : 0.75 : 2.5__________________**laterale** Loew.

F[2]. Second antennal joint longer than the first; length of joints, 1 : 1.25 : 2.5___________**fasciolatum** (DeGeer).

E[2]. Pteropleura yellow pilose; a more or less distinct yellow spot usually present above fore coxa.

F¹. Second sternite with yellow only on anterior margin; third sternite with a pair of yellow spots which touch the anterior margin; arcuate bands on tergites 3 and 4 not interrupted or only slightly so. **radiosum**, new species.

F². Second sternite with hind margin yellow; yellow spots on third sternite separated from anterior margin.

G¹. Arcuate bands on tergites 3 and 4 not interrupted. **integrum** Williston.

G². Arcuate bands on tergites 3 and 4 interrupted.

H¹. Basal antennal joints combined as long as, or longer than the third; a large yellow spot above fore coxa; basal half of venter largely yellow pilose______**pubescens** Loew.

H². Basal antennal joints combined shorter than the third; venter black pilose.

I¹. Face nearly straight in profile; antennal joints, 1:1:2________**plumeum** Johnson.

I². Face distinctly concave; antennal joints 1:0.5:2____________**perplexum** Johnson.

B². Palearctic species. (All here included are Asiatic except *cautum* and *fasciolatum*, European.)

C¹. Apical corners of tergites not projecting.

D¹. Third antennal joint longer than first and second ones together; dorsal abdominal bands extending over sides; sternites 2, 3, and 4 with yellow markings on anterior margin______________________________**ladakense**, new species.

D². Third joint as short as, or shorter than, basal ones.

E¹. Cheeks, below eyes, entirely black.

F¹. Lateral abdominal margins entirely yellow and with small black bristles__________**chinense**, new species.

F². Lateral margins alternate black and yellow, and yellow pile intermixed with the black bristles. **nigrifacies**, new species.

E². Cheeks yellow______________________________**cautum** Harris

C². Apical corners of tergites moderately to strongly projecting.

D¹. Pteropleura black pilose.

E¹. Arcuate abdominal bands extending upon sides.

F¹. Antenna shorter than fore tarsus__**tartar**, new species.

F². Antenna longer than fore tarsus. **fasciolatum** (DeGeer).

E². Arcuate abdominal bands separated from sides. **mongol**, new species.

D². Pteropleura yellow pilose.

E¹. Third joint about as long as basal joints, apical corners of tergites moderately projecting; moderate sized species.

F¹. Hind tarsi black; hind coxa with well-developed spinose tubercles________**tuberculatum**, new species.

F². Hind tarsi yellow; hind coxa (male and female) only with tuft of stiff black hairs_**fratellum**, new species.

E[2]. Third antennal joint much longer than basal ones combined; apical corners of tergites strongly projecting; very robust species.

F[1]. Second sternite with basal two-thirds yellow with a dark median line extending back to post margin; antennae partly yellow____________**draco, new species.**

F[2]. Second sternite black with yellow hind margins; antennae wholly dark_________**caeleste, new species.**

A[2]. Arista much shorter than combined length of first and second joints (fig. 1*c*), Palearctic species___________________________**Subgenus Chrysotoxum.**

B[1]. Only three yellow abdominal bands developed; no distinct yellow spot above fore coxa______________________________**bicinctum** (Linnaeus).

B[2]. At least four well-developed yellow stripes.

C[1]. Abdominal side margins entirely black; mark above fore coxa present or absent; second sternite obscurely yellow basally.

D[1]. Four anterior femora entirely yellow____**festivum** (Linnaeus).

D[2]. Four anterior femora black basally_____________**vernale** Loew.

C[2]. Abdominal side margins alternate black and yellow; a distinct yellow spot above fore coxa; second sternite broadly yellow basally.

D[1]. Wings without a distinct cloud near outer third on anterior margin ______________________________**elegans** Loew.
intermedium Meigen.
octomaculatum Curtis.

D[2]. Wings with a distinct cloud beyond middle near the costa.
japonicum Matsumura (?)

PRIMOCHRYSOTOXUM, new subgenus

Genotype.—Chrysotoxum ypsilon Williston.

This subgenus is differentiated from *Chrysotoxum*, *sensu stricto*, by the relative lengths of the antennal joints. In *Primochrysotoxum* the basal two antennal joints are but little elongated, and do not exceed the length of the arista. (Fig. 1*a* and 1*b*.) In *Chrysotoxum*, *sensu stricto*, the two basal joints are much longer than the arista. (Fig. 1*c*.)

CHRYSOTOXUM DERIVATUM Walker

Chrysotoxum derivatum Walker, List of Diptera, Brit. Mus., vol. 3, 1849, p. 542.—Curran, Can. Ent., vol. 56, 1924, p. 110.—Johnson, Occ. Papers Boston Soc. Nat. Hist., vol. 5, 1924, p. 97.

This species has been recorded a number of times since it was first made known. It is difficult to say how many of these records may be correct; however, it is quite certain that small specimens of *ventricosum* (northwestern United States) are usually recorded as *derivatum*.

The writer has examined the type of *derivatum* and found it to be different from all other species known to him. It is unusually small, 8 mm. The antenna and the fore tarsus are equal in length; the relative length of the joints are 1:1:2.5; the apical corners of the

tergites are moderately projecting, the arcuate abdominal bands are narrow and attain the margins of the tergites only at the apical corners; the pteropleura is partly black pilose. According to these characters, it would come in the key with *laterale* and *fasciolatum*, from which it may be separated by its smaller size and the relative length of the antennal joints.

Described from one male.

Type locality.—St. Martins Falls, Albany River, Hudson Bay, Canada.

Type.—In British Museum.

CHRYSOTOXUM VILLOSULUM Bigot

Chrysotoxum villosulum BIGOT, Ann. Soc. Ent. France, ser. 6, vol. 3, 1883, p. 323.—CURRAN, Can. Ent., vol. 56, 1924, p. 34 (misidentification).

The type specimen is in poor condition. The abdomen is lost and the head is glued on the thorax. The head seems to be much more globose in shape and the eyes much more pilose than in the other American species. Perhaps the head is mismated with the thorax and it may be that it belongs to a species which does not occur in America. In view of the unsatisfactory condition of the specimen and the original description, it has been decided to leave this species unrecognized in the present paper.

Curran has identified a species from Oregon, Washington, and Idaho as *villosulum*. The male of this species has the frontal triangle and the legs yellow pilose. Bigot's type specimen, a male, has the frontal triangle and the femora black pilose and the relative lengths of the antennal joints are 1:1.5:2.

Type locality.—"Washington Territory." One male.

Type.—In British Museum.

CHRYSOTOXUM CHINOOK, new species

Chrysotoxum villosulum Bigot, CURRAN, Can Ent., vol. 56, 1924, p. 34 (misidentification).

This species is close to *ventricosum*, but may be separated by its more extensive yellow coloration; frons of male yellow pilose; pteropleura yellow pilose; second sternite margined behind with yellow; uniformly larger size, 13–14mm. The antennal joints are 1:1.25:2.

Three specimens (2 males and a female, Idaho) are distinctly smaller, 9 mm. The arcuate abdominal bands are separated from the margins of the tergites as in *ventricosum*. Twenty specimens at hand.

Type locality.—Lewis Peak, Blue Mountains, Washington.

Type.—Male, Cat. No. 28665, U.S.N.M. Allotype female; six paratypes male and female. Other paratypes in V. Argo's collection.

Distribution.—Washington: Lewis Peak, Blue Mountains, July (V. Argo); Mount Adams, 4,000–6,000 feet, July (M. C. Lane). Locality? (Williston collection). Oregon: Mount Hood (Williston collection). Idaho: Mount Moscow, July (J. M. Aldrich: R. C. Shannon); Bitter Root Mountains, July (C. V. Piper).

CHRYSOTOXUM VENTRICOSUM Loew

Chrysotoxum ventricosum LOEW, Berlin Ent. Zeit., vol. 2, 1864, p. 44.—JOHNSON, Psyche, vol. 14, 1907, p. 77; Occ. Papers Boston Soc. Nat. Hist., vol. 5, 1924, p. 97.

The species may be recognized by the rather globose and evenly rounded abdomen, short antenna, the arista being much shorter and the third joint but little longer than the combined length of the basal ones; second sternite black except sometimes on anterior margin; the arcuate abdominal bands usually slender, narrowly interrupted at the middle and separated from the margins of the tergites; first tergite usually entirely black; frons of male usually black pilose; pteropleura usually black, pilose; sternopleura usually without yellow spot; base of femora usually black; size 7–13 mm.

Small specimens are sometimes misidentified as *derivatum* Walker. Three specimens (Idaho, Oregon, New Mexico) have the second and third arcuate bands entire.

Type locality.—Washington State.

Type.—In Cambridge Museum of Comparative Zoölogy.

Distribution.—Saskatchewan: Farewell Creek, July (V. A. Armstrong). British Columbia: South Fork, August 11, 1903 (R. P. Currie). Idaho: Moores Lake, July 10, 1907 (J. M. Aldrich); Bitter Root Mountains, July (C. V. Piper). Washington: Bonaparte Lake, 4,000 feet, July 4, 1921 (M. C. Lane); Lewis Park, Blue Mountains, July 1, 1923 (V. Argo). Locality? (Williston collection). Oregon: Mount Hood (Williston collection); Mount Hood, August 18, 1923 (G. P. Engelhardt); Crater Lake, 7,000 feet, August (G. P. Engelhardt); Marys Peak, Corvallis, July (G. P. Engelhardt); Manzanita, July 30, 1920 (L. P. Rockwood). Montana: Many Glaciers, July (G. P. Engelhardt). Colorado: Locality and collector? Tennessee Pass, 10,240 feet, July 10 (J. M. Aldrich). New Mexico: Locality? (Williston collection).

CHRYSOTOXUM COLORADENSE Greene

Chrysotoxum coloradensis GREENE, Proc. Ent. Soc. Wash., vol. 20, 1920, p. 70.—CURRAN (in part), Can. Ent., vol. 56, 1924, p. 35.

The entire arcuate bands on tergites 3 and 4 which attain the side margins of tergites and absence of yellow spot on the sternopleura

readily separate this species from *chinook*. The fourth and fifth tergites are very extensively yellow. The even-sided abdominal margins distinguish it from *integrum* which has the apical corners of the tergites produced.

Length, 13–15 mm.

Seven specimens, all males.

The antennal joints are approximately 1:1.5:2. The fore side hind margins of the fifth tergite are about 4.5:1:2.

Type locality.—El Paso County, Colo.

Type.—In United States National Museum.

Distribution.—Colorado: El Paso County, June 7 (Champlain). Locality and collector? Locality and collector (Coquillett collection). Montana: Locality? (Cornell University, lot 35, Williston collection). Idaho: Locality? (Cornell University, lot 35. Williston collection).

CHRYSOTOXUM YPSILON Williston

Chrysotoxum ypsilon Williston, Synopsis N. A. Syrphidae, 1886, p. 14.—Curran, Can. Ent., vol. 56, 1924, p. 39.

Large species with the arista much shorter than antenna, in the male the third joint as long as the basal ones combined, in the female the third joint is much the longer; pteropleura with black pile; anterior corners of abdomen mostly or entirely yellow pilose; abdominal bands broad and joining margins of tergites; lateral margins beyond middle of second tergite yellow; apical corners of tergites strongly projecting; second sternite with yellow post margin; sternites 3 and 4 and in the female the fifth each with a pair of large yellow spots; Length, 15–18 mm. Two males, three females.

Type locality.—New Mexico.

Type.—In United States National Museum.

Distribution.—New Mexico: Locality? (Williston collection); Pecos, June 21 (W. P. Cockerell). Nevada: Ormsby County, July 6 (C. F. Baker). Colorado: Locality and collector?

CHRYSOTOXUM AZTEC, new species

Chrysotoxum integrum Williston, Giglio Tos, Mem. R. Acad. Sci. Nat. Torino, ser. 2, vol. 43, 1893, p. 10 (misidentification).

Male.—Frons black pilose; antennal joints about 1:1:2.5; arista much shorter than length of antenna; mesonotum blackish pilose; pteropleura black pilose; base of abdomen mostly yellow pilose; bases of femora black; abdominal bands rather broad, joining sides of abdomen, which are yellow beyond middle of second tergite; apical corners of tergites moderately projecting; sternites yellow only on hind margins.

Female—Frons of usual width, black with a moderate size pair of pollinose spots. Length, 13–14 mm.; wing, 12 mm.

Close to *ypsilon*, which is larger and more robust; the abdominal bands broader, apical corners of tergites strongly projecting; and the sternites, except the first, with a pair of large yellow spots besides the yellow post margins.

The material recorded by Giglio Tos as *Chrysotoxum integrum* Williston, from Mexico, has been examined by the writer. All these specimens are the same as this new species, *aztec*.

Type locality.—Sierra Madre, Chihuahua, Mexico.

Type.—Cat. No. 28310, U.S.N.M. Male type; allotype, female; two male paratypes.

Distribution.—Mexico: Sierra Madre, Chihuahua, 7,300 feet, August 28 and September 9 (C. H. T. Townsend); Mound Valley, Chihuahua, August 23 (C. H. T. Townsend); Sanchez, Chihuahua (C. H. T. Townsend).

CHRYSOTOXUM OCCIDENTALE Curran

Chrysotoxum occidentale CURRAN, Can. Ent., vol. 56, 1924, p. 36.

A large robust species which differs from *ypsilon* in having black hairs on the apices of the fore coxae and the base of the abdomen black pilose. A male (hitherto unknown) agrees with the paratype female in these respects.

Length, 17–18 mm.

One male and one female.

Type locality.—British Columbia.

Type.—In Canadian National Collection.

Distribution.—Idaho: Moscow Mountains, July 10, 1920 (R. C. Shannon). British Columbia: Kaslo, June 5 (H. G. Dyar).

CHRYSOTOXUM LATERALE Loew

Chrysotoxum laterale LOEW, Berlin Ent. Zeit., vol. 8, 1864, p. 42.

The status of this species is uncertain. Only the female is known and its characterization is unsatisfactory. Characterized by the short second antennal joint, the relative lengths of the joints being 1:0.75:2.5; the pteropleura and base of abdomen with black pile; the arcuate bands of the abdomen reaching the sides of the abdomen which are alternate black and yellow; the apical corners of the tergites projecting. Length, 12–14 mm. Two females.

Type locality.—Nebraska.

Type.—In Cambridge Museum, Comparative Zoölogy.

Distribution.—New York: Lake George, September 4, 1920 (M. D. Leonard). New Hampshire: White Mountains, July (S. Scudder).

CHRYSOTOXUM FASCIOLATUM (DeGeer)

Musca fasciolatum DeGeer, Mem. peur serv. l'hist. d. Ins., vol. 6, 1776, p. 55.—Curran, Can. Ent., vol. 56, 1924, p. 40.

Differs from *laterale* chiefly by having the second antennal joint longer than broad, the relative lengths of the joints being 1:1.25: 2.5–3. Lengths about 15 mm. Three males, three females. Agrees essentially with European specimens.

Type locality.—Europe.

Type.—Location unknown.

Distribution.—Maine: Echo Lake, Mount Desert, June 17, 1921 (C. W. Johnson). New Hampshire: White Mountains (H. K. Morrison); Mount Washington, June 21, 1874 (H. K. Morrison); Mount Washington (H. G. Dimmock).

CHRYSOTOXUM RADIOSUM, new species

Chrysotoxum pubescens Loew, Curran, Can. Ent., vol. 56, 1924, p. 39 (misidentification).

A rather small to moderate sized species. Frons black pilose, the pollinose spots in female small; antennal joints 1:1.5:2, the arista much shorter than antenna; thoracic pubescence yellow, a few black hairs on scutellum; all femora, tibiae, and tarsi yellow; abdomen mostly yellow pilose above and below; arcuate abdominal bands entire or subinterrupted in middle, joining the posterior margins of the tergites and barely coloring the apical corners of the tergites, leaving the sides of the abdomen almost entirely black; apical corners of the tergites moderately produced; hind and side margins of fifth tergite in the female about equal, the anterior margin nearly three times as long as the side margins; wings infuscated anteriorly.

Length, 10–13 mm.

Separated from *integrum* and other allies by the absence of the yellow hind margin on the second sternite and the presence of a pair of yellow spots on the third sternite bordering on the anterior margin.

Type locality.—South Wanatah, Ind.

Type.—Cat. No. 28311, U.S.N.M. Male type; allotype, female; paratypes, four females.

Distribution.—Connecticut: New Haven, June 5, 1910 (A. B. Champlain). Indiana: South Wanatah, June 1, 1916 (J. M. Aldrich); LaFayette, September 30, 1915 (J. M. Aldrich). South Dakota: Brookings, June 16, 1891 (J. M. Aldrich). Washington: Locality? (Williston collection). State and locality? (bears the number 51).

CHRYSOTOXUM INTEGRUM Williston

Chrysotoxum integre WILLISTON, Synopsis N. A. Syrphidae, 1886, p. 16.—CURRAN, Can. Ent., vol 56, 1924, p. 39.

Chrysotoxum coloradense Greene, CURRAN, Can. Ent., vol. 56, 1924, p. 39 (in part).

A moderate sized species. Antennal joints about 1:1:2 in the male, and 1:1.25:3 in the female, apical corners of tergites distinctly projecting; arcuate abdominal bands entire and attaining side margins; sternites 2, 3, 4, and, in female, 5, with yellow postmargins and except the second with a pair of yellow spots. The relative lengths of the fifth tergite are 3.5:1:1 (compare with *coloradense*).

Length, 12–14 mm.

The material recorded by Williston in the Biologia Centrali-Americana as "*Chrysotoxum* sp.?" are all slight variations of *integrum* Williston, not sufficiently marked to rank as different species.

The specimen recorded by Giglo Tos as *integre* (Ditteri Messico) is *aztec* Shannon.

Ten males, nine females.

Type locality.—Arizona.

Type.—In United States National Museum.

Distribution.—Arizona: Locality? (Cornell University, lot 35, Williston collection); East Verde River, 4,500 feet. Mexico: Sierra Madre, Chihuahua, 7,300 feet, July 21 (C. H. T. Townsend); San Jacinto, D. F., August, 1923 (E. G. Smyth); Mexico City (Juan Müller). New Mexico: Springer, August 18, 1914 (W. R. Walton); Dripping Spring, Organ Mountains, April 24 (T. D. A. Cockerell). Utah: Blue Springs, 8,000 feet, August 29, 1923 (G. P. Engelhardt). Idaho: Moscow Mountains (J. M. Aldrich). Washington: Wawawai, May 30, 1923 (V. Argo); Asotin, May 19, 1923 (V. Argo).

CHRYSOTOXUM PUBESCENS Loew

Chrysotoxum pubescens LOEW, Wien Ent. Monat., vol. 4, 1860, p. 84.—GREENE, Proc. Ent. Soc. Wash., vol. 25, 1923, p. 84 (Puparium described).

Chrysotoxum derivatum Walker, HOWARD, Insect Book, 1901, pl. 21, fig. 31 (misidentification).

Chrysotoxum luteopilosum CURRAN, Can. Ent., vol. 56, 1924, p. 36.

Chrysotoxum currani WEHR, Univ. Studies Nebraska, vol. 22, Jan. 10, 1924, p. 9.

Chrysotoxum cuneatum WEHR, Univ. Stud. Neb., vol. 22, Jan. 10, 1924, p. 10.

A fairly large species easily recognized by the following characters: Antenna with the relative length of the joints about 1:1.5:2; the distinct yellow spot above the fore coxa; the interrupted bands on tergites 2, 3, and 4 attaining the apical corners; apical corners of

tergites rather strongly projecting; yellow pile above and below on the abdomen. Length, about 14 mm. One male, three females.

Type locality.—Illinois.

Type.—In Cambridge Museum Comparative Zoölogy.

Distribution.—Virginia: Fairfax County, June 11, 1922 (H. S. Barber); Falls Church, May 28, 1917, reared (C. T. Greene); Glencarlyn, May 21, 1921 (S. A. Rohwer); Falls Church, July 4, 1920 (S. A. Rohwer). Kansas: Onaga (Crevecoeur).

CHRYSOTOXUM PLUMEUM Johnson

Chrysotoxum plumeum Johnson, Occ. Papers Bost. Soc. Nat. Hist., vol. 5, 1924, p. 99.

Chrysotoxum ventricosum Loew, Curran, Can. Ent., vol. 56, 1924, p. 39 (misidentification).

A rather small species characterized by the straight or nearly straight face (in profile); antennal joints about 1:1:2; arcuate bands extending to sides of abdomen; second sternite with yellowish hind border, remaining sternites with or without anterior pair of spots.

Length, 10–12 mm.

Seventeen males, three females.

Type locality.—New Jersey.

Type.—In C. W. Johnson's collection, Boston, Mass.

Distribution.—New Jersey: Riverton, September 8 (C. W. Johnson); Caldwell, June 15 (C. W. Johnson). Maryland: Plummer Island, April 25, May 19 (R. C. Shannon); Odenton, June (R. C. Shannon); College Park (collector?). Virginia: Great Falls, May 9, 1920 (H. S. Barber).

CHRYSOTOXUM PERPLEXUM Johnson

Chrysotoxum perplexum Johnson, Occ. Papers Bost. Soc. Nat. Hist., vol. 5, 1924, p. 99.

Chrysotoxum laterale Loew, Curran, Can. Ent., vol. 56, 1924, p. 35 (misidentification).

A larger species than *plumeum* distinguished chiefly by its concave face (in profile) and relation of antennal joints, 1:5:2.

Four males, three females.

Type locality.—New Hampshire.

Type.—In C. W. Johnson's collection, Boston, Mass.

Distribution. — New Brunswick: St. John, August 15, 1898 ("W. M."). Maine: Locality and collector? Vermont: Bolton, July 15, 1923 (Owen Bryant). New Hampshire: Franconia, July 20 (C. H. T. Townsend); White Mountains, July (S. Scudder). New York: Lake George, September 4, 1920 (M. D. Leonard). Pennsylvania: Allegheny, July 9, 1891; Rockville, September 25, 1913 (A. B. Champlain). Maryland: Plummer Island, July 25 (R. C. Shannon).

CHRYSOTOXUM LADAKENSE, new species

Female.—Antennal joints 1 : 1 : 3; face prominent, moderately concaved; mesonotum with short, appressed, brownish pile; scutellum yellow; pteropleura yellowish pilose; legs yellow; arcuate abdominal bands rather broad, uniform in width, strongly curved and joining side margins of the tergites; sides of abdomen rather strongly flanged, of even contour and yellow beyond middle of third tergite; second sternite yellow at apical corners; third sternite with complete (narrowed at middle) yellow basal band, and yellow apical corners; fourth with large yellow spots at anterior corners and smaller ones at apical corners; fifth almost entirely black; wing with costal cloud extending only to tip of first vein.

Length, 13 mm.; wing, 12 mm.

One specimen.

Type locality.—Rupshu Ledak, 16,000 feet, Kashmir (July 22, 1897, W. L. Abbott).

Type.—Female, Cat. No. 28312, U.S.N.M.

CHRYSOTOXUM CHINENSE, new species

Male.—Fairly large species; frons black, black pilose; antennal joints 1: 1.5 : 5; arista a little shorter than two basal joints; face rather prominent, moderately concave; cheeks, below eyes, entirely black; mesonotum black pilose; peteropleura entirely black, with black pile; sternopleura entirely black; bases of femora darkened, remainder of legs yellow; abdomen strongly flanged, the side margins entirely yellow; arcuate bands joining lateral margins; second sternite black, narrowly yellow on post margin; sternites 3 and 4 with broad basal yellow bands; genitalia typical. Length, 15 mm.; wing, 12.5 mm. One specimen.

Type locality.—West of Chetu Pass near Tatsienlu, 13,000–15,000 feet, Szechuen, China (D. C. Graham).

Type.—Male, Cat. No. 28313, U.S.N.M.

CHRYSOTOXUM NIGRIFACIES, new species

Female.—A fairly large species; antennal joints 1 : 1.5 : 1.75; arista black, about equal to combined length of joints 1 and 2; frons entirely black, with two small pollinose spots; face prominent; cheeks entirely black; mesonotum black pilose with scattered longer black hairs; ptero- and sterno-pleurae entirely black, yellow pilose; femora darkened basally; margins of abdomen rather strongly flanged, alternate black and yellow; arcuate bands narrow, of uniform width, joining the side margins; post margins of tergites very narrowly yellow; last tergite twice as broad as long; second sternite entirely black, third with yellow band bordering on the anterior margin, fourth with two yellow spots bordering on anterior margin.

A male which is tentatively associated with this species has the cheeks partly obscurely yellowish.

Three females and the above-mentioned male, from the type locality.

Type locality.—Yellow Dragon Gorge near Songpan, 12,000–14,000 feet, Szechuen, China (D. C. Graham).

Type.—Female, and two female paratypes, Cat. No. 21314, U.S.N.M.

CHRYSOTOXUM TARTAR, new species

Female.—Distinguished from the foregoing by its much more yellowish appearance; antennal joints 1:1.25:2; arista yellow, longer than the basal joints; cheeks yellow; yellowish mesonotal and black scutellar pile; pteropleura black with black pile; sternopleura with yellow spot; femora darkened basally; abdominal pile mostly yellow, but blackish on first tergite; abdominal margins normally banded, alternately black and yellow; arcuate bands rather broad, joining side margins; yellow bands on post margins of tergites 3 and 4 very broad; yellow spots on sternites 4 and 5 not reaching anterior margin.

Length, 14 mm.; wing, 12 mm.

One specimen.

Type locality.—West of Chetu Pass near Tatsienlu, 13,000–14,500 feet, Szechuen, China (D. C. Graham).

Type.—Female, Cat. No. 21315, U.S.N.M.

CHRYSOTOXUM TUBERCULATUM, new species

Male.—A fairly large species possessing the unique character of an obtuse spinose spur on the hind coxa. Antennal joints 1:1.5:2; arista yellow and longer than the basal joints; frons black, broadly margined above with yellowish pollen; cheeks yellow; thorax entirely yellow pilose; an obscure yellow spot above fore coxa; a larger one on the sternopleura; legs yellow, the hind tarsi black and densely setose; abdominal pile rather long and yellow, with shorter and black hairs toward apices of sternites; abdominal margins alternate black and yellow; the apical corners of the tergites projecting; arcuate bands very moderately curved, the first broadened toward the ends and the yellow extending forward (inside of the black margin on the anterior half of the second tergite) nearly to the anterior margin; second sternite very narrowly yellow on hind margin; the third with a narrow anterior band which does not meet the fore margin, narrowly yellow on hind margin; the third with a narrow anterior band which does not meet the fore margin, narrowly yellow on post margin; the fourth very narrowly yellow on

fore and hind margins; genitalia unusually modified, the cerci bearing a dense tuft of pile; two dense tufts of reddish pile projecting inwardly from between the bases of the styles; the styles asymmetrical, the right-hand one rather short with two apical rounded projections, the left-hand one much longer and convoluted; wings without dark anterior border; length, 15 mm.; wing, 13 mm. One male.

Type locality.—Uen Chaun Shien, Szechuen, China, August 7, 1924 (D. C. Graham).

Type.—Male, Cat. No. 28316, U.S.N.M.

CHRYSOTOXUM FRATELLUM, new species

Male and female.—Differs from *tuberculatum* chiefly in its smaller size; legs entirely yellow; no spur on hind coxa, but with a tuft of short, stiff black hairs present instead (both sexes); apical corners of tergites very little produced; length, 12 mm.; wing, 11 mm.

Genitalia of male normal, the styles symmetrical.

Two males, one female.

Type locality.—West of Chetu Pass, near Tatsienlu, 13,000–14,500 feet, Szechuen, China (D. C. Graham).

Type.—Male, Cat. No. 28317, U.S.N.M.

Allotype.—Female; paratype, male.

CHRYSOTOXUM MONGOL, new species

Female.—Antennal joints 1 : 1 : 2.25; arista yellowish, a little longer than basal joints; face straight to the tubercular prominence, thence protruding; mesonotal pile mainly black; pteropleura black pilose; sternopleura with yellow spot; femora dark brown basally; abdominal side margins only beaded, black save at apical corners of tergites, which are moderately projecting; arcuate, strongly curved, separated from side margins, bands narrow, the second and third subinterrupted; second sternite entirely black; third with yellow band on anterior border; fourth with pair elongate yellow spots close to anterior border; margins of fifth tergite 3 : 1 : 1.25; anterior border of wing rather narrowly clouded; length, 15 mm.; wing, 13 mm. One female.

Type locality.—Yellow Dragon Gorge near Songpan, 12,000–14,000 feet, Szechuen, China, 1924 (D. C. Graham).

Type.—Female, Cat. No. 28318, U.S.N.M.

CHRYSOTOXUM DRACO, new species

Male.—A very robust and unusually marked species in which the yellow greatly predominates. Eyes bare; the black markings on the face and front have practically disappeared, only an obscure

median facial stripe present; antennae unusually short, the joints 1:1.25:4; the first two joints and basal half of the third yellowish below; the arista yellow and distinctly longer than antenna; thorax except mesonotum almost entirely yellow; legs including coxae and trochanters yellow; abdomen very broad; arcuate abdominal bands very broad, nearly bordering onto the anterior margins of second and third tergites; entire margins of abdomen yellow with densely set very short black stiff bristles; apical corners of tergites strongly projecting; second and third tergites yellow with black hind margins and dark median stripe; genitalia typical.

Length, 17.5 mm.; wing, 17 mm. One male.

Type locality.—Shin Kai Si, Mount Omei, 4,400 feet, Szechuen, China (D. C. Graham).

Type.—Male, Cat. No. 28319, U.S.N.M.

CHRYSOTOXUM CAELESTE, new species

Female.—A large robust species similar in size and dorsal abdominal coloration to *draco*. The following characters indicate the differences: Eyes pilose; frons black, basal antennal joints dark brown, third blackish; length equal to fore tarsus, relative length of joints 1:1.25:3.5; arista yellowish, much longer than basal joints combined; mesonotal pile brownish, dark posteriorly and on abdomen; pleural pile yellowish; pleura black with yellow spots on meso—and sternopleurae; dorsum of abdomen black at base, almost entirely yellowish brown beyond; side margins alternate black and yellowish brown; thickly beset with very short black hairs and longer yellowish ones; apical corners of tergites strongly projecting, less so than in *draco;* margins of fifth tergite 3:1:1; sternites 2, 3, 4, and 5 black with yellow post margins; anterior margins of wings brownish; length, 17 mm.; wing, 16 mm. One female.

Type locality.—9 miles southwest of Tatsienlu 8,500–13,000 feet, Szechuen, China (D. C. Graham).

Type.—Female, Cat. No. 28320, U.S.N.M.

CHRYSOTOXUM CAUTUM Harris

Chrysotoxum cautum Harris, Expos. Engl. Ins., 1892, p. 60.

Two males and one female, two of which bear Verrall's determination "*sylvarum* Mg." from Leigh, Essex, England. The third specimen bears the label "C. 8—*maculatum*," authority unstated. The male of this species is one of the few in this group which have the genitalia greatly modified, the styles being very broadly U-shaped.

Two other males and one female from France (Hervé-Bazin).

CHRYSOTOXUM FASCIOLATUM (De Geer)

Two females, Charteuse, France (J. Hervé-Bazin). Prof. J. Hervé-Bazin informs me that he has only females of this species in his collection.

Subgenus Chrysotoxum sensu stricto

CHRYSOTOXUM BICINCTUM (Linnaeus)

Musca bicinctum Linnaeus, Systema Naturae, 10 ed., 1758, p. 592.

This species, together with the five species considered below, may well be considered as a separate group from the above, the chief difference being the greater combined length of the basal joints over that of the third.

Two males and two females: England, Lyndhurst (Verrall); Germany; France, Bront-Vernet (H. du Buysson) and Ste Baume Forest (W. R. Thompson); two females, Le Patys, Segre, France, June 27, 1925 (Hervé-Bazin and Shannon).

The Kertesz Catalogue of Diptera, 1910, lists this species from America. As far as the writer is aware *bicinctum* does not occur in the New World.

CHRYSOTOXUM FESTIVUM (Linnaeus)

Musca festivum Linnaeus, Systema Naturae, 10 ed., 1758, p. 593.

This is apparently a very variable species of which the following species, *C. vernale* Loew, may be a variation. On the other hand, there is evidence in the material at hand to show that it may be a complex of several species. One male has very pronouncedly pilose eyes, whereas the other specimens have very sparsely pilose eyes. A number of specimens have a distinct yellow spot above the fore coxa and in others there is no trace of yellow at this position. One female has the fore: side: hind margins of the fifth tergite in the ratio of 5:1:4 and the width of the fifth sternite is about six times its length. This may simply be one type of many abnormalities to be found in the abdominal segments of the species of this genus. However, the arcuate bands are much narrower than in the other specimens.

Twenty-one specimens of this species were taken in about five hours' collecting at the home of Professor Hervé-Bazin, at Le Patys, Segré, France, June 27, 1925, by himself and wife and myself and wife. Four females are also at hand from Berlin, Germany (C. Schimer).

CHRYSOTOXUM VERNALE Loew

Chrysotoxum vernale Loew, Stettin. Ent. Zeit., vol. 2, 1841, p. 138.

Three males and three females, Berlin, Germany (C. Schimer); and Toulouse, France (H. du Buysson); Charteuse, France (Hervé-Bazin).

CHRYSOTOXUM INTERMEDIUM Meigen

Chrysotoxum intermedium MEIGEN, System Beschreib., vol. 3, 1822, p. 169.

One male and one female, Charteuse, France (J. Hervé-Bazin).

CHRYSOTOXUM ELEGANS Loew

Chrysotoxum elegans LOEW, Stettin. Ent. Zeit., vol. 2, 1841, p. 140.

One male, one female, Charteuse, France (J. Hervé-Bazin); one female, Bront-Vernet, France (H. du Buysson).

CHRYSOTOXUM OCTOMACULATUM Curtis

Chrysotoxum octomaculatum CURTIS, Brit. Entom., vol. 8, 1847, p. 653.

Three females from Berlin, Germany (C. Schimer).

CHRYSOTOXUM JAPONICUM Matsumura

One female from Japan (Harrington) agrees with the description in Matsumura's Synopsis of Economic Syrphidae of Japan.[2] The description of the antennae as given in the key and the description are at variance. Apparently No. 2 in couplet 1 of the key should be 6 and No. 5 should be 2.

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[2] Ent. Mag., vol. 2, pp. 3 and 6, 1916.

SPECIES OF CHRYSOTOXUM NOT STUDIED BY THE WRITER

Chrysotoxum antiquum Walker, Insecta Saunders, Dipt., vol. 1, 1852, p. 218. India.

(*Musca*) *Chrysotoxum arcuatum* (Linnaeus), Systema Naturae, 10 ed., 1758, p. 592. Europe.

Chrysotoxum baphyrus Walker, List Diptera, Brit. Mus., vol. 3, 1849, p. 542. Bengal.

Chrysotoxum bigoti Giglio Tos, Atti R. Accad. Sci., Torino, vol. 26, 1890, p. 154. Italy.

Chrysotoxum biguttatum Matsumura, J. Coll. Sapporo, vol. 4, 1914, p. 72. Japan.

Chrysotoxum cisalpinum Rondani, Ann. Soc. Ent. France, ser. 2, vol. 3, 1845, p. 197. Europe.

Chrysotoxum continum Bezzi, Syrphidae, Ethiop., 1915, p. 178. E. Africa.

Chrysotoxum convexum Brunetti, Fauna Brit. India, Syrphidae, 1923, p. 298. India.

Chrysotoxum convexum Brunetti, Rec. Ind. Mus., vol. 11, 1915, p. 249. India.

Chrysotoxum elongatum Hardy, Australian Zoologist, vol. 2, 1921, p. 13. Tasmania (=Xylotinae).

Chrysotoxum erracticum Walker, List Diptera Brit. Mus., vol. 3, 1849, p. 543. Country unknown.

Chrysotoxum flavifrons Macquart, Dipt. Extot., vol. 2, 1842, p. 17. Newfoundland. Unrecognizable.

Chrysotoxum flavipenne Palma, Annal. Acad. Aspir. Natur. Napoli, ser. 3, vol. 3, 1863, p. 40. Italy.

Chrysotoxum fuscomarginatum Brunetti, Fauna Brit. India, Syrphidae, 1923, p. 300. India.

Chrysotoxum grandis Matsumura, J. Coll. Sapporo, vol. 4, 1914, p. 72. Japan.

Chrysotoxum holtzi Becker, Ann. Mus. Zool. Ac. St. Peterb., vol. 17, 1912, p. 605. Persia.

Chrysotoxum kozhevnikovi Smirnov, Ent. Mitteil, vol. 14, 1925, p. 291.

Chrysotoxum lessonae Giglio Tos, Atti R. Accad. Sci. Torino, vol. 26, 1890, p. 144. Italy.

Chrysotoxum lineare Zetterstedt, Kongl, Vet. Akad. Handl., vol. 1, 1819, p. 82. Europe.

Chrysotoxum mundulum Hervé-Bazin, Bull. Soc. Ent. France, 1923, p. 27. Cochin-China.

(*Syrphus*) *Chrysotoxum? nigrita* Fabricius, Species Insect., vol. 2, 1781, p. 427. Jamaica. (This may not belong to the genus *Chrysotoxum* but has been placed in this genus by Wiedemann.)

Chrysotoxum parmese Rondani, Ann. Soc. Ent. France, ser. 2, vol. 3, 1845, p. 198. Italy.

Chrysotoxum przewalskyi Portschinsky, Horae Soc. Ent. Ross., vol. 21, 1887, p. 6. Asia.

Chrysotoxum quadrifasciatum Brunetti, Fauna Brit. Ind., Syrphidae, 1923, p. 300. India.

Chrysotoxum robustum Portschinsky, Horae, Soc. Ent. Ross., vol. 21, 1887, p. 7. Persia.

Chrysotoxum rotundatum Hervé-Bazin, Bull. Soc. Ent. France, 1923, p. 27. Indo-China.

Chrysotoxum sachalinensis Matsumura, J. Coll. Sapporo, vol. 4, 1914, p. 72. Japan.

Chrysotoxum sackeni Giglio Tos, Atti R. Accad. Sci. Torino, vol. 26, 1890, p. 150. Italy.

Chrysotoxum sibiricum Loew, Vehr. Zool.-bot. Ver. Wien, vol. 6, 1856, p. 8. Siberia.

Chrysotoxum stipatum Walker, Insecta Saunders., Dipt., vol. 1, 1852, p. 219. Country unknown.

Chrysotoxum testaceum Sack, Ent. Mitt., vol. 2, 1912, p. 9. Formosa.

Chrysotoxum triarcuatum Macquart, in Webb and Berth.: Hist. Nat. I'les Canar., Entom., Dipt., 1838, p. 107. Canary Islands.

Chrysotoxum violaceum Brunetti, Fauna Brit. India, Syrphidae, 1923, p. 302. India.

NEW LAND AND FRESH-WATER MOLLUSKS FROM CENTRAL AND SOUTH AMERICA

By William B. Marshall
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Eight of the eleven new species here described were received from various correspondents during the last few months. The other three were brought to light in revising the Museum collections. Two of the species are from Central America, the others from South America.

ODONTOSTOMUS (CYCLODONTINA) CHASEAE, new species

Plate 1, fig. 8

Shell thin, slender, elongate; whorls eight and one-half, very slightly rounded, subcrenulate along the sutures, which are impressed; sculpture consisting of many fine, flexuous, retractive lines of growth. First four (nepionic) whorls corneous, the apical whorls regularly grated like finely woven wire. Color yellowish white, with irregularly placed, retractive streaks of chestnut, and a faint, narrow white band on the periphery. Aperture about two-fifths the length of the shell, its sides parallel to the axis, its basal portion nearly semicircular. Lip expanded throughout its course, being narrowly expanded at the upper end of the outer lip, the expansion regularly increasing from there to the upper end of the columellar lip, at which point a minute portion is suddenly reflected toward the umbilicus. Lip white, a brown band just within the aperture from the upper corner of the outer lip to and including the lower edge of the broad fold or tooth on the columella, and another brown stripe farther within; and a faint spiral band within the aperture, corresponding to the faint peripheral band on the exterior. Parietal wall with a small callus at the end of the outer lip and another at the end of the columellar lip; a small, platelike tooth near the middle of the parietal wall, a low tooth, or rather a swelling at the middle point of the outer lip, another similar but slightly larger tooth near the middle of the basal portion of the lip, and a strong, platelike, broad, twisted tooth near the upper end of the columella. Umbilicus

blackish, narrow, the base of the shell below it spirally angulated. Behind the aperture are two short constrictions. The upper one at the end of the faint white peripheral spiral line, and giving rise to the small tooth or swelling just within the outer lip at its middle point; the lower one giving rise to the small tooth just within the basal portion of the lip.

The type (Cat. No. 362151, U.S.N.M.) measures: Length, 25 mm.; diameter, 9.5 mm.; length of aperture 9 mm. It and six paratypes (Cat. No. 362152, U.S.N.M.) were presented by Mrs. Agnes Chase, who collected them "on bare cliffs of rock, north face of Paulo Affonso Falls in Rio São Francisco, State of Alagoas, Brazil, December 1, 1924."

The State of Alagoas lies between the States of Pernambuco on the north and Sergipe on the south; and Paulo Affonso Falls are about 140 miles above the mouth of the São Francisco.

The species is most nearly related to *Odontostomus* (*Cyclodontina*) *inflatus* Wagner, but is much more slender, has much stronger growth riblets, and has the teeth, especially those on the outer lip, much smaller.

ODONTOSTOMUS (CYCLODONTINA) IHERINGI, new species

Plate 1, fig. 10

Shell rather strong, fusiform-turrited; whorls seven and one-half, somewhat rounded; sculpture of many strong, flexuous retractive growth riblets, the upper ends of which subcrenulate the sutures; apical whorls finely grated. Color faded, but on the back of the body whorl enough color remains to show that there was a chestnut strigation at that point, and that the whorl just back of the lip was chestnut. Aperture about two-fifths the length of the shell, is sides parallel to the axis, lip white, expanded all round, a moderately thick callus across the parietal wall. Channel at upper end of outer lip and that at upper end of columellar lip obsolete. Aperture nearly filled with teeth of which there are eight as follows: A minute tooth at the left end of the parietal wall, a large heavy tooth to the right of the middle of the wall, two small fairly acute teeth in the upper portion of the outer lip, followed by a very heavy drooping tooth reaching more than halfway across the aperture at the middle of the outer lip, base of lip with two platelike teeth, the one to the right being the larger and a heavy drooping triangular tooth on the columella. Edges of all the teeth white, the sides of the heavy tooth on the outer lip, the sides of the two basal teeth and the lower side of the columellar tooth brown; umbilicus narrow, the base of the shell below it spirally angulated. Behind the aperture are two short, deep constrictions, the upper one giving rise to the large tooth

at the middle of the outer lip and the lower one giving rise to the larger of the two basal teeth.

The type (Cat. No. 362153, U.S.N.M.) measures: Length, 20 mm.; diameter, 7 mm.; length of aperture, 8 mm. It and a paratype (Cat. No. 194201, U.S.N.M.) come from Goyaz, Brazil, and were presented by Dr. H. von Ihering, who says they were collected by Baer in 1906.

The nearest relative of this species is *Odontostomus* (*Cyclodontina*) *scabrellus* Anthony, which is longer, more slender, has heavier axial riblets, a distinct channel at the upper end of the outer lip and one at the end of the columellar lip, and has only 7 teeth, each of which is smaller than the corresponding tooth of *iheringi*.

SUCCINEA FELIPPONEI, new species

Plate 1, fig. 4

Shell rather thick, inflated, ovately globose, with very large aperture. Whorls 3½, descending slowly, the body whorl about four-fifths the length of the shell. Suture well impressed. Sculpture consisting of a number of riblike, slightly retractive lines of growth marking former locations of the outer lip, and lesser growth lines on and between these riblets General color pale creamy, with a dark line just back of and emphasizing each principal growth line, the interior with the same colors as the exterior. Aperture oval, two-thirds the length and three-fifths the diameter of the shell, a prominent callus on the parietal wall running down to the midpoint of the columella.

The type, U.S.N.M., Catalogue No. 362976, measures: Length 14.5 mm.; greater diameter, 9.5 mm.; lesser diameter, 6 mm.; length of aperture 10 mm.; width of aperture 6 mm. It and a paratype, Cat. No. 362977, U.S.N.M., come from the Carrasco, Department of Montevideo, Uruguay, and were presented by Dr. Florentino Felippone.

The inflated form, the riblike growth lines, and the dark longitudinal markings on the creamy background make this a well-marked species.

AMPULLARIA SUPERBA, new species

Plate 1, fig. 9

Shell imperforate, turbinate, rather thick; whorls six in number, well rounded, body whorl very large; sutures well impressed, narrowly margined. Surface apparently smooth and glossy, but a lens reveals a minute axial sculpture of numerous growth striae and a number of revolving lines made up of very fine granules. The periostracum of the two earliest whorls is eroded; on the next two whorls it is fairly well preserved and shows that it bore numerous revolv-

ing granulose striae. With sufficient magnification the granules are seen to be > shaped, with the point directed toward the right-hand side of the whorl. Most of them are of a rich chestnut color and in spots where large numbers of them are preserved they give a velvety appearance to the surface. Aperture large, about seven-tenths the length of the shell, its outer lip flaring, its columellar lip thick and rounded and so formed at its upper end as to have the appearance of covering an umbilicus; parietal wall with a thick, white callus. General color ashy and brownish, with many revolving, chestnut-colored bands, which show prominently on the inner portion of the outer lip and less distinctly for some distance within the shell.

The type, Cat. No. 362863, U.S.N.M., measures: Length, 53 mm.; diameter, 43 mm.; length of aperture, 36 mm.

It comes from Cienaga Totuma, Department of Atlantico, United States of Columbia and was collected and presented by T. A. Link. Its nearest relative is *Ampullaria pealeana* Lea, than which it is much larger, more globose, thicker, of darker colors and has more numerous bands.

In addition to the fine axial sculpture of growth striae mentioned in the description there is a still finer axial sculpture, which shows in spots, especially above the suture, and which requires a compound microscope to reveal it. This sculpture consists of flattened threads, of which there are some 75 to the millimeter and seems to be in the calcareous portion of the shell and not in the periostracum. The threads are about three times as wide as the intervening spaces and are so uniform in width that apparently they were formed with mathematical precision. This sort of structure has been found in a number of species of *Ampullaria* and probably each thread represents the unit of advance in growth of the shell.

NEPHRONAIAS LEMPENSIS, new species

Plate 2, figs. 4, 6; plate 3, fig. 4

Shell rather compressed, nearly elliptical in outline, rounded at both ends, the posterior end very slightly narrower than the anterior. Dorsal and ventral margins about equally curved, both of them rounding into the anterior and posterior margins as in an ellipse and with no tendency to an angle of any kind. Shell rather thin at the posterior end, moderately thickened at the antero-ventral portion. No distinct anterior and posterior ridges, the disk of the valve blending gradually into the anterior and posterior dorsal areas, the descent at front being rapid, at the rear gradual. Beaks low, eroded, located at the anterior third of the shell. Periostracum somewhat clothlike, not glossy, but with a slight sheen. Color nearly uniform chestnut, with faint indications of rays of green. (In younger

shells these rays are quite evident.) Sculpture consisting of three well-marked concentric lines of growth with a number of small concentric striae between them. Beak cavities shallow, with a line of muscle scars at the front portion. Anterior adductor scars deep, with a pair of minor muscle scars back of them; posterior adductor scars shallow, but perceptible to the touch. Right valve with two pseudocardinal teeth, the inner one large, the outer one very small and platelike, with a narrow groove between the two teeth. The left valve also with two pseudocardinals set obliquely one behind the other and rather ragged. One lateral tooth in the right valve, two in the left valve, all of them obliquely striated in a generally longitudinal direction. Nacre pearly, with scarcely any iridescence, of a generally bluish cast, but with a pinkish or flesh-color tinge in the antero-ventral region. Prismatic border very narrow, less than a millimeter in width.

The type, Cat. No. 361764, U.S.N.M., measures: Length, 53 mm.; height, 30 mm.; diameter, 15 mm. It comes from the Rio Lempe, Salvador, at the railroad bridge and was collected February 9, 1924 by Hildebrand and Foster, under the auspices of the United States Bureau of Fisheries. In addition to the type there are five other specimens, Cat. No. 360388, U.S.N.M., collected at the same time and same place. They are exactly like the type except in size and, in the young specimens, the rays of green color.

This species is closely related to *Nephronais rowellii* Lea, from which it differs in being much more compressed, in being thinner, in having the beaks nearer the anterior end, and in being more nearly elliptical.

ELLIPTIO DIVARICATUS, new species

Plate 1, figs. 1, 2; plate 3, fig. 3

Shell compressed, subrhomboid, rounded and narrower in front, wider, obliquely truncate, and obscurely biangulate posteriorly. Beaks located at about the anterior third of the length. Dorsal and ventral margins slightly curved. Posterior ridge low but prominent, slightly riblike to the touch, accentuated by a radiating stripe of color darker than the body of the shell. Color ashy olive, lighter in the anterior portion. Posterior dorsal area with three radiating stripes of smoky tinge, the lowest one on the dorsal ridge. Sculpture of four concentric impressed lines marking rest periods in growth and most of the surface covered with radiating, more or less interrupted riblets. At the anterior end the riblets are absent, on the posterior ridge they bifurcate, and on the posterior dorsal area they curve gently toward the margin. Nacre with a light coppery tinge of color, and slightly iridescent in the posterior portion. Somewhat thickened in front. Beak cavities shallow. An-

terior aductor scars deep and rough; the posterior ones nearly superficial and smooth. Pallial line well marked, about 3 mm. from the ventral margin; prismatic border very narrow. Right valve with a single pseudocardinal tooth, and a single lateral somewhat remote from the beak; left valve with two pseudocardinal teeth, the inner one the larger, and the space between them shallow, broad. Lateral teeth in both valves obliquely striated and grooved.

The type, Cat. No. 362398, U.S.N.M., measures: Length, 32.5 mm.; height, 20 mm.; diameter, 11 mm. It comes from Finca de Providencia, Guatemala, and was received without name from H. Rolle, of Berlin, Germany.

The nearest relative to this species is *Quadrula guatemalensis* Simpson. The genus *Quadrula* does not seem to be the proper allocation for *guatemalensis* nor for the present species, which is here placed doubtfully in the genus *Elliptio*, to remain until the true generic positions of the Mexican and Central American granulous Maiads are finally determined.

Cat. No. 362399, U.S.N.M., includes a paratype, in which the granulation is not quite so abundant and on which there are two very broad dark radiating rays which are made up of many very fine greenish radiating lines. It measures: Length, 38 mm.; height, 22.5 mm.; diameter, 13 mm.

TETRAPLODON LINKI, new species

Plate 1, figs. 6, 7; plate 3, fig. 2

Shell subrhomboid, rather thick, subinflated, beaks about the middle of the dorsal line, posterior end obliquely truncate, anterior end narrower and rounded. Posterior dorsal ridge moderately high, subangulate. Hinge line straight, slightly oblique, ventral margin a little arcuate. Sculpture consisting of 28 radiating ribs, which are narrow and subnodulous on the anterior and posterior areas, smooth, wide and low on the middle portion of the shell; concentric sculpture of many raised growth striae which are emphasized on the radiating ribs; three rest periods indicated. Color uniform ashy olive. Interior pearly, iridescent at posterior portion, bluish white, having an appearance of being numerously, finely, radiately striate; anterior adductor scars deep, posterior scars superficial, prismatic border a mere line. Right valve with two pseudocardinal teeth, the inner one the larger, and with three small denticles behind it on the hinge area; left valve with one pseudocardinal tooth split into about five denticles. Right valve with one lateral tooth which is short and has many vertical striae on its inner and outer faces; left valve with two lateral teeth, the inner one much the larger and strongly vertically ribbed on its upper face.

The type (Cat. No. 362860, U.S.N.M.) measures: Length, 25.5 mm.; height, 19 mm.; diameter, 15 mm. It comes from Sinu River at Lorica, Province of Bolivar, United States of Colombia, South America, and was collected and presented by Theodore A. Link of the Tropical Oil Co. Lorica is in the northwestern corner of Colombia, near the mouth of the Sinu River, which empties into the Gulf of Morosquillo, an arm of the Gulf of Darien, Caribbean Sea.

The lot sent by Mr. Link included also fifteen-odd valves (Cat. No. 362861, U.S.N.M.). Some of these are older and larger than the type, the largest measuring: Length, 42 mm.; height, 28.5 mm. These larger specimens show that the radiating ribs are not developed or have a tendency to become obsolete in the portion of the shell formed after the size of the type has been attained.

The only species to which this is closely related is *Tetraplodon ecarinata* Mousson, which occurs in the Magdalena River, United States of Colombia. *Ecarinata* is less elongate, of rounder form, has the ventral margin more arcuate and the radiating ribs rounded instead of flattened.

HYRIA WHEATLEYI, new species

Plate 1, figs. 3, 5; plate 3, fig. 1

Shell small, solid, somewhat inflated, subrhomboid, wide and nearly squarely truncate posteriorly, narrow and oblique anteriorly; very slightly alate at both ends. Hinge line slightly arched; posterior and anterior margins making distinct (nearly right) angles with the dorsal margin. Ventral margin curved, sloping rather sharply into the anterior margin which is very short. Greatest diameter at the center of the shell, anterior ridge lacking, posterior ridge high, rounded, made to appear sharp by one of the radiating ribs of the beak sculpture running along its summit. Concentric sculpture of fine striae with two rest periods accentuated by a dark line. Beak sculpture radial, very bold and regular, consisting of 16 continuous principal ribs, one on the posterior ridge and the others anterior to it, and several interrupted minor riblets on the posterior dorsal area. The six middle ribs are arranged into three "nested" pairs, the two ribs in each pair converging and pointing ventrally. If continued other ribs would converge in pairs thus "nested." Interior iridescent pearly, appearing to be finely, radially striated, the striae more marked along the ventral margin. Pseudocardinal teeth of right valve two, the inner one large and divided into four denticles; the outer one small, low and linear. Pseudocardinal of left valve with a large socket. Lateral tooth of right valve high, slightly curved, obscurely striated, vertically and obliquely. The two lateral teeth of left valve distincty obliquely striated, the inner tooth the higher. Anterior adductor scars deep, especially at the

upper part; posterior adductor scars well marked but shallow. Pallial line about 5 mm. from the margin. Prismatic border a mere line.

The type, Cat. No. 85336, U.S.N.M., measures: Length, 25 mm.; height, 19 mm.; diameter, 12½ mm. It came from Rio Negro, 1,200 miles up the Amazon. It is part of the Isaac Lea collection.

Dr. I. Lea identified this species as *Unio wheatleyanus* Lea, and Simpson arranged it in that species in the genus *Diplodon*. It is true that it bears some resemblance to that species, but careful comparison with the type of *D. wheatleyanus* shows that it does not belong there, and the angular junctions of the anterior and posterior margins with the dorsal margin, the alate character of the two ends of the hinge line, though slight, and the style of beak sculpture lead to the belief that it belongs in the genus *Hyria*. Its habitat in the Amazon further strengthens the belief that it is a *Hyria*. Lea's type of *Diplodon wheatleyanus* came from Montevideo, Uruguay. Perhaps the most striking difference between the two is in the beak sculpture, which in *Diplodon wheatleyanus* is divergent while in *Hyria wheatleyi* it is convergent. Judging by its small size and few rest periods the type of this new species is probably immature. It is old enough to show that it differs from all the species hitherto described, especially in its moderately inflated form, the regularity of the beak sculpture, and the slight alateness of the ends of the hinge area.

DIPLODON ASUNCIONIS, new species

Plate 2, figs. 2, 8; plate 3, fig. 5

Shell solid, elongately ovate, slightly nasute, somewhat inflated, rounded and narrower in front, truncate and wider behind; dorsal and ventral margins subparallel, lightly curved. Anterior ridge not distinctly differentiated; posterior ridge high and sharp near the beak, gradually flattening out and becoming nearly obsolete as it approaches the margin. Anterior area full, rapidly descending from the disk of the shell; posterior area somewhat concave. Anterior margin rounding into the dorsal and ventral margins; posterior margin making an obtuse angle with the dorsal margin, and a blunt point with the ventral margin. Beaks set well forward, somewhat eroded, high, sculptured with 12 very strong radiating ribs which continue to the middle of the shell; anterior area with three sharp, fine, short radiating riblets; posterior area with five similar but longer riblets. General sculpture consisting of indistinct concentric striae with three rest periods accentuated. There are indications of radiating interrupted riblets. Periostracum dull, closely adhering, and of a uniformly rich chestnut color throughout. Nacre whitish, slightly

iridescent posteriorly, thicker in front, an obscure sulcus showing the location of the posterior ridge. Anterior adductor scars very deep; posterior scars well marked but shallow. In the right valve there are two pseudocardinal teeth which are parallel to each other, the outer one the smaller, the inner one transversely subdivided near the beak. In the left valve there is one pseudocardinal divided into three parts, the middle part being small. All the pseudocardinals are strongly striated vertically and the summits are crenulated. Lateral teeth long and slightly curved and obliquely striated; the single one in the right valve being obsoletely vertically striated. The outer one of the two laterals in the left valve is the smaller. Pallial line well impressed, 4 to 5 mm. from the margin. Prismatic border a mere line.

The type, Cat. No. 361959, U.S.N.M., measures: Length, 40 mm.; height, 25 mm.; diameter, 18.5 mm. It comes from the Paraguay River at Asuncion, Paraguay, and was presented by Dr. Florentino Felippone. It classifies between *D. burroughiana* Lea and *D. trifidus* Lea, but is more nearly related to the latter. It differs from *trifidus* in being much less nasute, in being less elongate and more inflated, in color, which in *trifidus* is greenish while in *asuncionis* it is uniformly rich chestnut, and in having the posterior ridge much less sharply angled. In beak sculpture the two species are very similar, but in *asuncionis* it is stronger and the posterior dorsal area near the beaks has five fine, elevated, sharp lines. In *asuncionis* the lateral tooth of the right valve is single as it normally is in the Naiades; but in *trifidus* it is divided lengthwise into three parts, the middle part being large and similar to the usual lateral tooth, the inner being much lower and nearly as long as the middle part, the outer part very small and only about half the length of the middle part. This divided lateral probably suggested the name *trifidus*. The type seems to be the only specimen of *trifidus* ever found, and it may be that the divided lateral is an individual character.

DIPLODON (CYCLOMYA) SMITHI, new species

Plate 2, figs. 1, 7; plate 3, fig. 6

Shell compressed, rather thin, subquadrate, narrower and rounded in front, broad and obliquely truncate in the rear. Surface nearly evenly rounded, with but little convexity and lacking a clearly defined posterior ridge. Posterior area rounding up gently and anterior area more abruptly into the middle portion of the shell. Most of the shell, excepting the anterior and posterior areas, with obscure, coarse, radiating lines similar to those in *D. felipponei* Marshall, *D. funebrale* Lea, *D. patelloides* Lea, and others of that group. Beak sculpture consisting of 12 coarse, radiating ribs, the

two middle ones joining to form a V. Rest periods about seven indicated by stronger grooves than those of the minor concentric sculpture and by a concentric darkening of color. Color chestnut brown, the posterior half darker than the anterior. Periostracum glossy, paperlike, tending to peel at the posterior margin. Prismatic layer very thin, about the same thickness as the periostracum and peeling with it. Nacre silvery white, slightly iridescent at the posterior portion, an indistinct groove from the beak to the ventro-posterior corner. Anterior adductor scars deep, posterior scars superficial. Pallial line indistinct, about 10 mm. from the ventral margin. Prismatic margin very narrow. Pseudocardinal teeth rather thin, platelike, set nearly parallel to the dorsal margin. In the right valve the outer tooth is the smaller while in the left valve it is the larger. Just under the beak in each valve is a third portion of the pseudocardinal, small and set transversely to the hinge line. The lateral teeth are somewhat bowed, the single lateral of the right valve being very high and thin. Of the two laterals in the left valve the inner is the larger and the groove between the two teeth is deep and narrow. All the lateral teeth are crenulate and much striated.

The type, Cat. No. 363027, U.S.N.M., measures: Length 76 mm.; height, 52 mm.; diameter 26 mm. It comes from Tigre River, Tigre, Buenos Aires, Argentina. Cat. No. 348794, U.S.N.M., includes two younger specimens from the same place. All three specimens were collected and presented by Dr. Hugh M. Smith, for whom the species is named.

ANODONTITES IRISANS, new species

Plate 2, figs. 3, 5; plate 3, fig. 7

Shell elongate-oblong, compressed, rather thick, rounded and narrower in front, truncately rounded, wider and somewhat nasute behind; dorsal margin lightly arcuate, making an indistinct, very obtuse angle with the posterior margin and rounding into the anterior margin. Ventral margin nearly straight, sloping gently upward toward and fading into the anterior margin without any angle. Anterior area descending rapidly from the body of the shell without a ridge; posterior area gently sloping, the posterior dorsal ridge low and rounded. Posterior dorsal area with a faint rib running from the beak to just above the posterior ventral angle. Surface nearly smooth but with many fine concentric growth lines and a few heavier lines marking rest periods of growth. Anteriorly and posteriorly the fine growth lines are more prominent, forming fine lamellae. To the unaided eye there are faint indications of radiating striae. With a fairly high power microscope the periostracum shows innumerable radiating threads. Color chestnut brown throughout. Interior brilliantly pearly, very iridescent along the anterior, posterior, and

ventral portions and especially in the adductor scars. General color of interior bluish. Anterior adductor scar moderately deep posterior scar nearly superficial; prismatic margin very narrow and of a dark olive color. Pallial line very feebly marked, about 8 mm. from the margin.

The type, Cat. No. 359920, U.S.N.M., measures: Length, 70 mm.; height, 39 mm.; diameter, 32 mm. It comes from Venezuela and was received from Mrs. T. S. Oldroyd, of Leland Standford University, to whom a paratype was returned.

Except for the differences in the character of the hinge this shell in both internal and external features is almost an exact counterpart of specimens of the common *Elliptio complanatus* of the United States. Its nearest relative is *Anodontites leotaudi* Guppy, which comes from the island of Trinidad.

NOTE ON DIPLODONTITES COOKEI MARSHALL

A specimen, Cat. No. 362862, U.S.N.M., of this species, received from Theodore A. Link, came from the Quebrado Perro, an affluent of the Rio San Jorge, which becomes tributary of the Rio Cauca which later joins the Rio Magdalena, about 200 miles above its mouth. This locality is in the Province of Bolivar, United States of Colombia. The locality of the type lot, the only other specimens known, is in a tributary of the Rio Colorado, an affluent of the Rio Magdalena in the Province of Santauder, United States of Colombia. While the known geographic range of the species is extended by the specimen from Link it remains confined to tributaries of the Rio Magdalena.

This specimen measures: Length, 66 mm.; height, 37 mm.; diameter, 29 mm. The largest specimen heretofore known, a paratype, measures: Length, 56 mm.; height, 32 mm.; diameter, 20 mm. The specimen from Link has the appearance of being a very old shell. It has the sculpture and the exact colors of the type, but the ventral edge is somewhat arcuate and the valves widely gape anteriorly. At that point each valve has a shelly growth attached along the inner edge of the prismatic border, forming a little shelf about 17 mm. long and 6 mm. wide, reaching inward as far as the pallial line. Its free edge is dark and resembles a prismatic border and may be one. Its exposed surface has fine striae like those in the periostracum of the shell. The indications are that the edges of the mantle were turned back and continued a shell growth directed toward the beaks instead of away from them.

EXPLANATION OF THE PLATES

Plate 1

Fig. 1. *Elliptio divaricatus.* Right valve. Type.
2. *Elliptio divaricatus.* Left valve. Type.
3. *Hyria wheatleyi.* Right valve. Type.
4. *Succinea felipponei.* Type.
5. *Hyria wheatleyi.* Left valve. Type.
6. *Tetraplodon linki.* Right valve. Type.
7. *Tetraplodon linki.* Left valve. Type.
8. *Odontostomus (Cyclodontina) chaseae.* Type.
9. *Ampullaria superba.* Type.
10. *Odontostomus (Cyclodontina) iheringi.* Type.

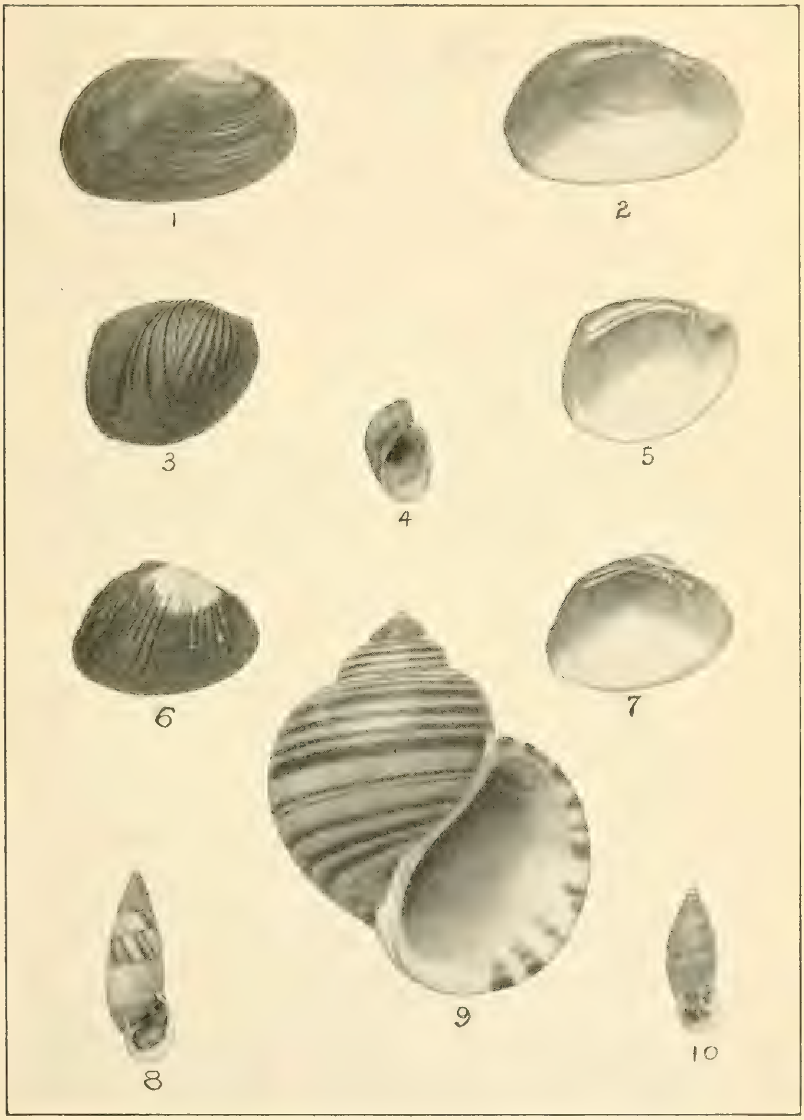
Plate 2

All figures three-fourths natural size

Fig. 1. *Diplodon (Cyclomya) smithi.* Left valve. Type.
2. *Diplodon asuncionis.* Left valve. Type.
3. *Anodontites irisans.* Right valve. Type.
4. *Nephronaias lempensis.* Right valve. Type.
5. *Anodontites irisans.* Left valve. Type.
6. *Nephronaias lempensis.* Left valve. Type.
7. *Diplodon (Cyclomya) smithi.* Right valve. Type.
8. *Diplodon asuncionis.* Right valve. Type.

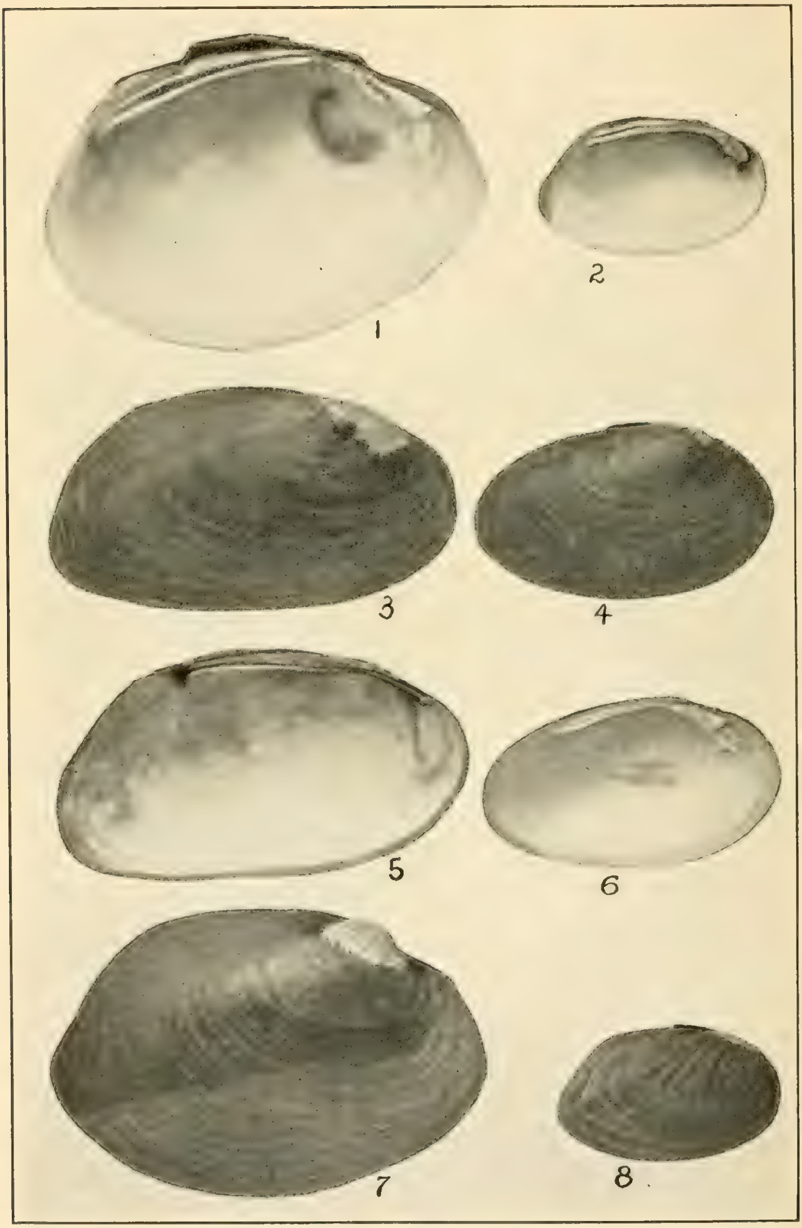
Plate 3

Fig. 1. *Hyria wheatleyi.* Dorsal view. Type.
2. *Tetraplodon linki.* Dorsal view. Type.
3. *Elliptio divaricatus.* Dorsal view. Type.
4. *Nephronaias lempensis.* Dorsal view. Type.
5. *Diplodon asuncionis.* Dorsal view. Type.
6. *Diplodon (Cyclomya) smithi.* Dorsal view. Type.
7. *Anodontites irisans.* Dorsal view. Type.



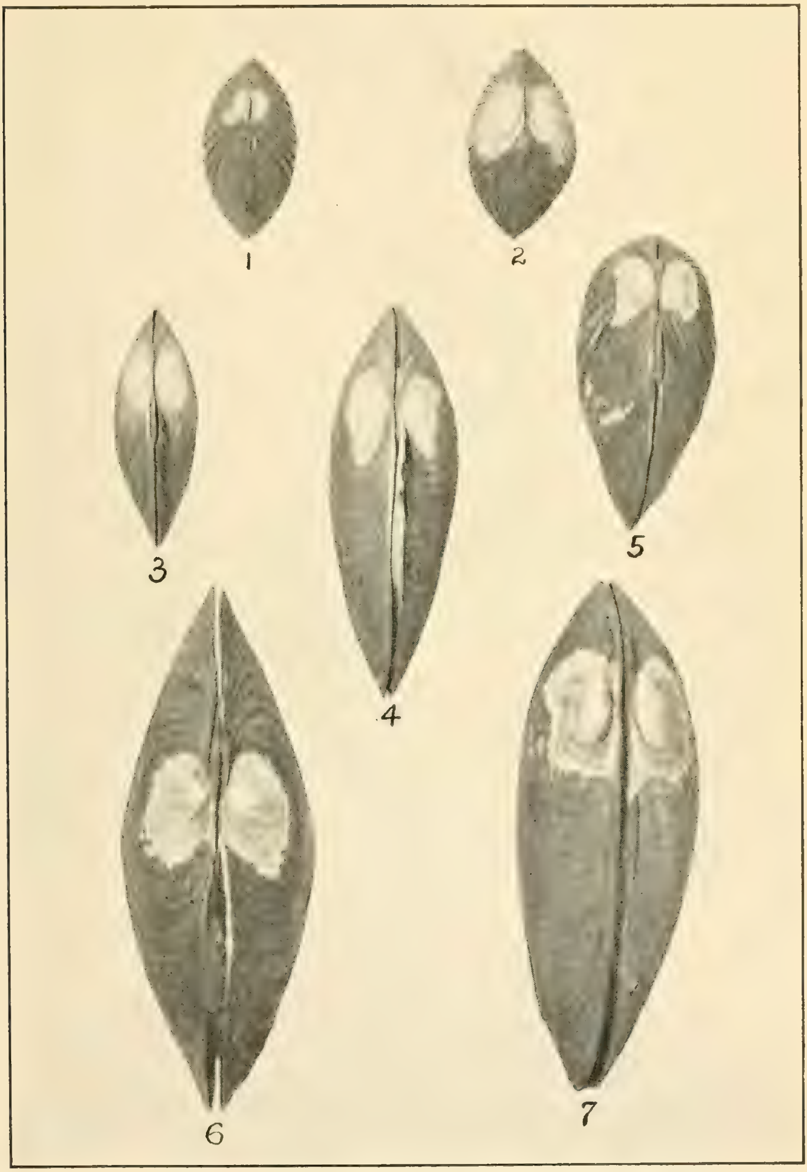
New Central and South American Mollusks

For explanation of plate see page 12



NEW CENTRAL AND SOUTH AMERICAN FRESH-WATER MOLLUSKS

FOR EXPLANATION OF PLATE SEE PAGE 12



NEW CENTRAL AND SOUTH AMERICAN FRESH-WATER MOLLUSKS

FOR EXPLANATION OF PLATE SEE PAGE 12

AMERICAN TWO-WINGED FLIES OF THE GENUS MICROPHTHALMA MACQUART, WITH NOTES ON RELATED FORMS

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Flies of the genus *Microphthalma* have been reared many times as parasites of larvae of May beetles of the genus *Phyllophaga*. They are undoubtedly of great economic importance. A recent examination of the literature and of the United States National Museum collections has shown that a considerable degree of confusion exists in the identification of specimens. It therefore seemed advisable to publish the results of these studies.

Genus MICROPHTHALMA Macquart

Microphthalma Macquart, Dipteres exotiques, vol. 2, pt. 3, 1843, p. 241.—Coquillett, Revision of the North American Tachinidae, 1897, p. 138.—Adams, in Williston's Manual, 1908, p. 376.—Curran, Ent. News, vol. 36, 1925, p. 15.

Eumicrophthalma Townsend, Insecutor Inscitiae Menst., vol. 3, 1915, p. 97.

Perua Townsend, Proc. U. S. Nat. Mus., vol. 43, 1912, p. 364.

The type and sole original species is *nigra* Macquart; the type and sole species of *Eumicrophthalma* is *shannoni* Townsend; and that of *Perua* is *cuzcana* Townsend.

The type species *nigra* has heretofore been supposed to be a synonym of *distincta*. As explained farther on, I identify this as a separate species, differing slightly in the form of the antennae and in the presence of ocellar bristles from *distincta*. This modification brings *Microphthalma* so close to *Perua* that the latter must apparently become a synonym. The occasional presence of small ocellars in *Microphthalma michiganensis* would seem to prevent the recognition of the ocellars as a generic character in this group, while the other characters appear to be strictly of specific importance. If there are two genera here, *Eumicrophthalma* should be extended to cover *distincta*, *michiganensis*, and *flaviceps*, as well as *shannoni*; in this case *Microphthalma* will cover *nigra*, *cuzana*, and *townsendi*. I do not favor this division.

The genus forms a typical case of Brauer's character of the vibrissal angles narrowing the clypeus, as the vibrissae are close together and high up, only a little below the middle of the head in profile, while the median space below them is greatly narrowed for a considerable distance. Antennae rather short and resting in a depression; arista bare or slightly pubescent. The parafacials have scattered distinct short hairs. Eye very small, so that there is an enormous area below it, bare and usually concave, the cheek or bucca at least equal to the eye in height. Head moderately long above but short at the oral cavity, the profile receding, especially below the vibrissae. Proboscis small, palpi rather small. The wing has a strikingly long stump at the bend of the fourth vein, and the first posterior cell is open, ending before the tip of the wing. Veins bare except for a few hairs at base of the third vein.

Related American genera, as far as represented in the National Museum, may be tabulated as follows:

KEY TO AMERICAN GENERA RELATED TO MICROPHTHALMA

1. Fourth vein straight beyond the hind cross vein, with distinct stump or branch at the bend; discal bristles absent ---------- 2
   Fourth vein curved backward beyond the hind cross vein, with rounded V-shaped bend and no branch ---------- 4
2. Arista plumose (type *caninum* Fabricius) ---------- **Dexiosoma** Rondani.
   Arista bare or pubescent ---------- 3
3. Abdominal sternites bearing clusters of spiny bristles (type *rufiventris* Macquart) ---------- **Megaprosopus** Macquart.
   Abdominal sternites without spiny bristles (type *nigra* Macquart), **Microphthalma** Macquart.
4. Front not prominent, head lenticular in shape (type *opaca* Townsend), **Megapariopsis** Townsend.
   Front prominent, nearly horizontal (type *mexicana* Brauer and Bergenstamm, synonym of *calogaster* Bigot) ---------- **Macrometopa** Macquart.

I have redescribed the genotypes of *Megaprosopus* and *Macrometopa* in Annals of the Entomological Society of America (vol. 17, 1924, p. 211).

KEY TO SPECIES OF MICROPHTHALMA

1. Third antennal joint black, usually reddish at base about to the arista -- 2
   Third antennal joint red, sometimes slightly infuscated at tip ---------- 4
2. Small cross vein not infuscated, wings hyaline (Peru) --- **cuzcana** Townsend.
   Small cross vein infuscated, wings decidedly clouded basally ---------- 3
3. Tip of first antennal joint produced above into a scale projecting over and beyond the base of the second joint (Guatemala to New Mexico) ---------- **nigra** Macquart.
   Tip of first antennal joint not produced (Peru) ---------- **virens**, new species.
4. With only two sternopleurals; smallish, rather slender species, front of head wholly red ---------- **ruficeps**, new species.
   With three sternopleurals ---------- 5
5. Abdomen with silvery or white crossbands on basal third or half of segments 2, 3, and 4, the remainder of the segment more polished black, contrasting (U. S., widespread) ---------- **disjuncta** Wiedemann.
   Abdomen entirely pollinose, not with contrasting crossband ---------- 6

6. Scutellum with three pairs of lateral bristles; large species, 12 to 13 mm. long (U. S., widespread) ________________________ **michiganensis** Townsend.
   Scutellum with two pairs of lateral bristles; small species, 6 mm. long ________________________ **shannoni** Townsend.

MOCROPHTHALMA NIGRA Macquart

Microphthalma nigra MACQUART, Dipteres exotiques, vol. 2, pt. 3, 1843, p. 242.—WILLISTON, Trans. Amer. Ent. Soc., vol. 13, 1886, p. 306.

Microphthalma sordida GIGLIO-TOS, Boll. real. Univ. Torino, vol. 8, No. 147, 1893; Mem. Accad. Sci. Torino, ser. 2, vol. 44, 1894, p. 63.

Microphthalma pruinosa COQUILLETT, Canad. Entomologist, vol. 34, 1902, p. 200.

The original locality was "North America." Giglio-Tos described *sordida* from Toluca, Mexico, not far west of Mexico City. Coquillett described *pruinosa* from New Mexico and Chihuahua. For Davis's reference to *pruinosa*, see *michiganensis*.

Both the second and third antennal joints are longer in the males than in the other species; the first joint is produced in a scale as noted in the key, and the third joint becomes black just beyond the arista. Ocellar bristles are present in all specimens examined.

The material in the National Museum comprises 12 specimens including type and paratype of *pruinosa;* the others are from Hell Canyon, Manzano National Forest, New Mexico (Townsend); Cloudcroft, New Mexico (W. Knaus); Mount Lemon, Santa Catalina, Arizona, 7,800 feet (collector unknown, the specimen belongs to the American Museum of Natural History); Coapa, Federal District, Mexico, and Atzcapco, Mexico (E. G. Smyth); and Volcan Santa Maria, Guatemala (Schaus and Barnes).

Twelve additional specimens were later collected by the writer on the Polochic River near its head, Alta Vera Paz, Guatemala, May 25, 1926. The species was very abundant, and only lack of time prevented the collection of a still larger number.

Length, 9.4 to 11.4 mm.

Macquart mentioned the color of the antennae very clearly, which apparently fixes his species.

MICROPHTHALMA DISJUNCTA Wiedemann

Tachina disjuncta WIEDEMANN, Analecta Ent., 1824, p. 45; Auss. Zweifl. Insekten, vol, 2, 1830, p. 295.

Miltogramma trifasciata SAY, Journ. Acad. Nat. Sci. Phila., vol. 6. 1829, p. 174; Complete Works vol. 2, p. 365.

Trixa apicalis WALKER, List Dipterous Ins. in Brit. Mus., vol. 4, 1849, p. 699.

Tachina trixoides WALKER, List, etc., vol. 4, 1849, p. 760.

Microphthalma disjuncata COQUILLETT, Revis. Tachinidae, 1897, p. 138.—AUSTEN, Ann. and Mag. Nat. Hist., vol. 19, 1907, p. 327 (syn. of *apicalis*).—ADAMS, in Williston's Manual, 1908, p. 370, fig.—TOWNSEND, Muscoid Flies, 1908, p. 54.—ALDRICH, Annals Ent. Soc. America, vol. 8, 1915, p. 82.—DAVIS, Bull. Illinois Nat. Hist. Survey, vol. 13, 1919, p. 78.—GREENE, Proc. U. S. Nat. Mus., vol. 60, 1922, p. 11, fig.

This is a widespread and fairly abundant insect in North America, the larvae being parasitic on those of the May beetles, various species of *Phyllophaga*. It was originally described from "North America"; *trifasciata* was from Indiana; *apicalis* was published without locality; *trixoides* was from Georgia. Coquillett reported *disjuncta* from New Hampshire to Georgia, Texas, and California, but no doubt included specimens of *michiganensis*.

Major Austen has recently assured me, from a reexamination of Walker's types, that *apicalis* and *trixoides* belong here rather than to *michiganensis*.

The species is recognized by the banded abdomen, the apical half or more of segments 2, 3, and 4 being black, while the base is silvery pollinose. Specimens from the Southwest (New Mexico and Arizona) have a little wider pollinose bases than most of the eastern. Townsend had labeled this form in the collection as *vibrissata* Van der Wulp. I thought at first it might be a distinct species, then only a subspecies, and finally concluded that some of the eastern specimens are just about as pollinose as these and gave up designating them by a special name. In these, rather more conspicuously than in the eastern specimens, there is a tendency for the mesothoracic pollen to be brown in the female and pure gray in the male.

Material in the National Museum consists of 47 specimens: South Windsor, Connecticut (Riley collection); Harrisburg, Pennsylvania, and vicinity (Walton); Pittsburgh, Pennsylvania (Klages); Virginia Beach, Virginia (Knab); White Springs, Florida (Townsend); Utica, Mississippi; Lafayette, Indiana (Aldrich); St. Joseph, Illinois (Malloch); Leroy, Illinois (Riley collection); Opelousas, Louissiana (Pilate); Texas; Onaga, Kansas (Crevecoeur); Manitou Park, Colorado (F. H. Snow); Las Cruces, New Mexico (Townsend); Pecos, New Mexico (Cockerell); El Porvenir, Pecos National Forest, New Mexico (Townsend); Las Vegas, New Mexico (Barber); Hell Canyon, Manzano National Forest, New Mexico (Townsend); East Verde River, Arizona (Townsend); Botfly Canyon, Pinal Mountains, Arizona (Townsend); Sabino Basin, Santa Catalina Mountains. Arizona (Townsend).

Length, 8.7 to 14 mm., mostly over 11 mm.

MICROPHTHALMA MICHIGANENSIS Townsend

Megaprosopus michiganensis Townsend, Trans. Amer. Ent. Soc., vol. 19, 1892, p. 111; Muscoid Flies, 1908, p. 54.

Microphthalma phyllophagae Curran, Entomological News, vol. 36, 1925, p. 16.—Petch and Hammond, 55th Report Ent. Soc. Ontario, 1925, p. 25.

Microphthalma pruinosa Davis, Bull. Illinois Nat. Hist. Survey, vol. 13, 1919, p. 79.

Coquillett included this species in *distincta*. Mr. Curran has notified me of the synonomy of *phyllophagae*, having seen the type of *michiganensis* after the publication of his species. It was this species and not *nigra* which Davis mentioned (as *pruinosa*) as being widespread in the eastern United States, reared from *Phyllophaga anxia*. I am responsible for the misidentification.

The species differs from *distincta*, with which it is often confused, by the characters of the key, and by hardly anything else. On the pollinose pattern of the abdomen it can be separated quite readily, as shown by the considerable series of both in the collection.

The United States National Museum contains 18 specimens of *michiganensis*, as follows: Six paratypes of *phyllophagae*, all from Hemmingford, Quebec (G. H. Hammond); 2 from Beverly, Massachusetts (Riley collection); 2 from District of Columbia, bred from larvae of *Phyllophaga arcuata* (Pergande Nos. 2932 and 5163); one Plummer Island, Maryland (D. H. Clemons); one Hagerstown, Maryland (W. E. Pennington, bred from Phyllophaga); 3 Lafayette, Indiana (Aldrich); 2 Brookings, South Dakota (Aldrich); one Victoria, Texas (W. E. Hinds). The Quebec material was bred from *Phyllophaga anxia*.

Length, 9.5 to 13 mm.

MICROPHTHALMA SHANNONI Townsend

Eumicrophthalma shannoni TOWNSEND, Insecutor Inscitiae Menstruus, vol. 3, 1915, p. 98.

The single female type specimen from Eastern Branch, District of Columbia, is the only one as yet known. The front is 0.41 of the headwidth, as compared with 0.36 in the female of *nigra*, genotype of *Microphthalma*. The third antennal joint is red, but toward the apex the edge is blackened. The palpi are relatively somewhat smaller than in *nigra*, but not otherwise peculiar. The first posterior cell is open, not closed as the description states. The abdomen is covered with thin pollen, through which the black ground color appears in some lights to be subshining, with only a narrower deeper pollen at the extreme base of the segment. The hind cross vein is a little more erect than in *nigra*, but can be exactly matched in some specimens of *disjuncta*; it shows indications of the sinuation which is striking in some specimens of *nigra*. There are only two lateral pairs of scutellar bristles, instead of three as in the other species. The parafrontals, mesonotum, and scutellum are clothed with brownish pollen.

MICROPHTHALMA CUZCANA Townsend

Perua cuzcana TOWNSEND, Proc. U. S. Nat. Mus., vol. 43, 1912, p. 364.

Described from a single female taken by Dr. C. H. T. Townsend at Cuzco, Peru. The type is in the United States National Museum, and no additional material has been seen.

MICROPHTHALMA RUFICEPS, new species

Male.—Front at the narrowest (just before ocelli) 0.24 and 0.27 of the head width (in the two specimens).

The whole front of the head, beginning a short distance from the ocelli and extending to the mouth and part way up the posterior orbit, is red in ground color overlaid with thin silvery pollen; no ocellar bristles; frontal bristles about seven, only the hindmost pair decussate and a little reclinate. Antennae red with only a very slight trace of infuscation at tip of third joint; second joint fully half the third; arista short, black, with only microscopic pubescence; palpi yellow, small; dorsum of thorax with dense gray pollen showing when viewed from behind a narrow black stripe each side between the acrostichals and the dorsocentrals, ending a little behind the suture, and a broader interrupted outer stripe, the part before the suture being triangular, the remainder extending almost to the scutellum. Scutellum with three lateral bristles, the middle one, however, rather small, and a large decussate apical pair.

Abdomen with broad pollinose hands of gray, the posterior third or more of the second and third segments subshining and in some lights with brown pollen; fourth segment gray pollinose to the middle, remainder shining; first segment without median marginals; second with one pair; third segment with marginal row of ten; fourth segment with irregular bristles, beginning a little before the middle, and an apical row considerably smaller. Genitalia brown. Legs black; claws and pulvilli enlarged; middle tibia with two bristles on outer front side; hind tibia with an irregular scattered row on outer hind side. Calypters white. Wings subhyaline, the veins yellowish red; hind cross vein and apical cross vein decidedly black. No distinct infuscation, even on the small cross vein. Third vein with about six small hairs at the base; the fourth vein ends in the costa considerably before the apex, its distance from extreme apex is fully equal to the costal segment between third and fourth veins.

Length, 8 mm.

Described from two males, collected by C. H. T. Townsend at Wild Horse Canyon, Animas Mountains, New Mexico; altitude 5,000 feet.

Type.—Male, Cat. No. 28862, U.S.N.M.

MICROPHTHALMA VIRENS, new species

Female.—Front at vertex (narrowest part) 0.34 of the head-width (the same in two specimens). Parafrontals and parafacials densely covered with golden pollen which extends to the border of the mouth and covers the back of the head except the upper portion. First two joints of antennae red, the third joint black except the extreme base; second joint fully half as long as third; arista short,

bare; palpi yellow; beard yellow. Pollen of thorax and scutellum rather greenish, on the humeri yellowish-gray; the black stripes of the mesonotum are very distinct from all angles, the inner ones interrupted at the suture and extending only a short distance beyond it, the outer ones widely separated at the suture in two portions; the hindmost of these runs to a point as far back as the last intraalar. Scutellum with two lateral bristles and a large decussate apical pair.

The pollen of the abdomen is rather uniform, but thinner and darker along the hind edge of the segments, while at the anterior edge in some lights an indistinct paler crossband is barely evident; first segment without median marginals; second with one pair, large and erect; third with a large marginal row of eight; fourth with a somewhat irregular discal row of 8 or 10 and an apical row of the same number but smaller. Legs black, all the tibiae reddish in the middle, the middle ones with three bristles on the outer front side; the hind tibiae with two or three bristles on the outer hind side, the one at the middle rather strkingly elongated, equal to the longest one on the middle tibia.

Wings deep brown, fading out to some extent along the hind edge and apex, the hind cross vein and apical cross vein, however, quite strongly bordered; third vein with half a dozen bristles crowded together at the base. Calypters brown with narrow, yellow border. Length, 9 mm.

Described from two females collected by C. H. T. Townsend on Huascaray Ridge, Jaen Province, Peru; altitude 7,000 feet. Date of collecting, September 21 and 22.

Type.—Female, Cat. No. 28863, U.S.N.M.

DEXIOSOMA VIBRISSATUM Van der Wulp

Dexiosoma vibrissatum VAN DER WULP, Biologia, Dipt., vol. 2, 1891, p. 244, pl. 5, fig. 13.—GIGLIO-TOS, Mem. Reale Accad. Sci. Torino, ser. 2, vol. 44, 1893, p. 63.

Originally described from Tabasco, Mexico; Giglio-Tos reported it from Teapa and Tuxpango, Mexico. Townsend labelled the gray New Mexican form of *disjuncta* as *Microphthalma vibrissata*, but two specimens recently received of a widely different species seem to fit much better. These are females from Higuito, Costa Rica, collected by Pablo Schild. Unfortunately both have lost the third antennal joint, but the shortness of the second indicates that the third was probably more than three times the second, as Van der Wulp says. The first posterior cell opens much nearer the apex than in any of the species of *Microphthalma*, so that the distance between the tips of the second and third veins is more than twice that between the tip of third and the exact apex of the wing. According to Van der Wulp, the arista is densely plumose, which with the an-

tennal characters and venation agree with the genotype of *Dexiosoma.*

The face in profile is like Van der Wulp's figure, having a wide space between the vibrissa and the next bristle below. The wings are quite brown. The thoracic stripes agree with the description of *vibrissatum;* there is a narrow distinct stripe on each side, inside of the dorsocentral row, ending a little behind the suture, and outside the row there is a much wider and very conspicuous stripe extending almost to the scutellum.

Length, 6.6 and 7 mm., as compared with 10.5 given by Van der Wulp.

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CLASSIFICATION OF THE CHEILOSTOMATOUS BRYOZOA

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INTRODUCTION

The Cheilostomata, the highest developed of the five orders of bryozoa, had their origin in the Jurassic rocks of Europe, where they are represented by a few primitive species. By late Mesozoic times, they had expanded into so many species that from then until the present, they remained the predominating order. In the recent seas, the Cheilostomata exhibit the bryozoa at their greatest stage of perfection and beauty, and this fact in connection with their abundance, has made them the subject of numerous studies.

Most of the Cheilostomata form most beautiful objects from an artistic standpoint because the frontal wall of the zooecium is composed of calcite arranged in most delicate and often bizarre patterns. The earlier classifications of the Cheilostomata were based upon differences in these patterns, so that a purely artificial arrangement of genera and families resulted. The calcification of the frontal wall forming these beautiful patterns is, however, only one of the functions of the bryozoan and a natural classification must necessarily be based upon all the important functions. Living bryozoa show that, 1, reproduction exhibited in the development of the ovicell and its operculum, 2, the hydrostatic system dealing with the extrusion of the polypide, and 3, calcification and chitinization or the nature of the skeletal parts of the animal are the essential functions arranged in the order of their importance. Therefore the least important of these functions was alone considered when so many of the ancient genera and indeed many of the more modern ones were instituted.

In the course of our work upon the Post-Paleozoic bryozoa, we have devoted much attention to generic discrimination in an endeavor

to evolve a natural classification based upon all the functions mentioned above. Our work upon the genera of Cheilostomata has progressed to such a point that we now feel justified in offering the present classification and alphabetic list of genera for the benefit of students in this subject.

In our monographs of 1920 and 1923 upon North American Tertiary Bryozoa we have published descriptions and text figures of many genera of Cheilostomata. In addition to a general classification and alphabetic list, we now present descriptions of some new families and genera which are more fully elaborated and illustrated in works now in preparation. In cases where we are in doubt regarding the classification of a genus, the genotype and original reference are given. In all other instances we give only the date since the literature is cited in the Synopsis of American Fossil Bryozoa by Nickles and Bassler [1] and in our monographs of Early Tertiary Bryozoa [2] and Later Tertiary and Quaternary Bryozoa.[3]

DESCRIPTIONS OF FAMILIES AND GENERA

Order CHEILOSTOMATA Busk

Suborder ANASCA Levinsen

Division 1, MALACOSTEGA Levinsen

Family BIFLUSTRIDAE Smitt, 1872

Membraniporae without ovicells. The zooecia are rectangular (seen on their dorsal face). No spines.

In this family we classify all the genera of the first group of Membraniporae as we divided them in 1920 (p. 85), except *Discoflustrellaria* D'Orbigny, 1853, which we now refer to the family Mamilloporidae.

In addition to these genera we also refer *Quadricellaria* D'Orbigny, 1851, *Cellarinidra* new name and *Membraniporina* Levinsen, 1909, to the family.

Genus CELLARINIDRA, new name

(*Cellarina* D'Orbigny, 1851, preoccupied)

The zoarium is articulated; the segments are cylindrical with cells on all the faces. The zooecia have a cryptocyst more or less developed and angular; the opesium is elliptical. There are small interopesial avicularia.

Genotype.—Cellarinidra (*Cellarina*) *clavata* D'Orbigny, 1851. Cretaceous.

[1] 1900. Bulletin 173, U. S. Geological Survey.
[2] 1920. Bulletin 106, U. S. National Museum.
[3] 1923. Bulletin 125, U. S. National Museum.

Family ELECTRINIDAE D'Orbigny, 1851

Genus TRETOSINA, new genus

Greek: *tretos*, perforated, in allusion to the aspect of the distal portion of the cryptocyst

The eggs are grouped in the distal portion of the zooecium and escape by two small perforations or by a very narrow transverse slit. The zooecia are membraniporoid with cryptocyst developed.

Genotype.—*Tretosina arcifera*, new species. Tertiary of Australia. (Pl. 1, fig. 6.)

Family HINCKSINIDAE, new family [4]

We have grouped in this new family all the Membraniporae of our Section II of 1920, namely, those with endozooecial ovicells. It is rather probable that this family forms only a section of a more extended family comprising the Flustridae and Farciminariidae, but as the larvae are unknown we prefer not to make any more important changes in the nomenclature. *Hincksina* Norman, 1903, *Vibracellina*, *Membrendoecium* and *Ogivalina* Canu and Bassler, 1917, and *Setosellina* Calvet, 1907, of this family are described and illustrated in our work of 1920.

The genus *Cribrendoecium* Canu and Bassler, 1920, is now referred to this family as it is derived normally from *Hincksina.* The following new genus *Aplousina* also has the family characters in simple form.

Genus APLOUSINA, new genus

Greek: *aplous*, simple, referring to the absence of adventitious organs

The ovicell is endozooecial. No spines, no avicularium, no dietellae.

Genotype.—*Aplousina gigantea*, new species. Gulf of Mexico. (Pl. 1, fig. 1.)

Range.—Miocene—Recent.

Membrendoecium grandis Canu and Bassler, 1923, from the American Miocene, should be classed in this new genus, which differs from *Membrendoecium* in the absence of avicularia.

Family ALDERINIDAE, new family

We propose this new family for all the Membraniporae in which the ovicell is hyperstomial. It comprises therefore the third and

[4] This family and several other new families and genera have been named but not described by Canu in 1925 in his monograph with Lecointre upon the "Bryozoaires Cheilostomes des Faluns de Touraine et d'Angou" upon the expectation that the present work, delayed in publication, would appear first. This delay has given us the opportunity to include the results of Doctor Harmer's work upon the Cheilostomata of the "Siboga" Expedition.

fourth sections of Membraniporae in our classification of 1920. In addition to these two groups, this new family includes most of the genera of the miscellaneous Membraniporae which we listed in 1920. A discussion of our reasons for including *Cribrilina*, *Acanthocella*, and *Membraniporella* in this family is given in our unpublished work on the bryozoa of the Gulf of Mexico.

Division 2. COILOSTEGA Levinsen, 1909

Family ASPIDOSTOMIDAE Canu, 1908

Genus MONOPORELLA Hincks, 1881

The genus *Monoporella* was poorly defined and figured by Hincks and its structure was unknown until Harmer's work of 1926. In 1925 *Chrossotoechia* was proposed for this type of structure. On Plate 1, figure 2, we illustrate a new species of this generic type.

Family ARACHNOPUSIIDAE Jullien, 1888

Genus EXECHONELLA, new genus

Greek: *exechon*, salient, in allusion to the form of the peristomie.

The frontal pores are orbicular. A peristomie very much developed, surrounds an orifice closed by a true operculum. The ectocyst is hidden under the frontal.

Genotype.—*Exechonella* (*Hiantopora*) *magna* MacGillivray, 1895.

Range.—Eocene (Lutetian)—Recent.

Division 3. PSEUDOSTEGA Levinsen, 1909

Family CELLARIIDAE Hincks, 1880

Genus CRYPTOSTOMARIA, new genus

The ovicell is endotoichal, and deprived of any apparent orifice; it is situated at the base of the zooecium where it forms a semicircular convexity. The apertura bears two small lateral indentations; it is deprived of denticles.

Genotype.—*Cryptostomaria crassatina*, new species. Recent. (Pl. 1, fig. 5.)

Genus STOMHYPSELOSARIA, new genus

Greek: *stoma*, mouth, *hypselos*, high, elevated, in allusion to the place of the apertura.

The ovicell is endotoichal opening by a wide semicircular orifice placed obliquely above the operculum and situated at the base of the distal zooecium where it forms a very salient convexity. The aper-

tura bears two very small lateral indentations; it is deprived of denticles.

Genotype.—*Stomhypselosaria condylata*, new species. (Pl. 1, fig. 3.)

Genus MESOSTOMARIA, new genus

Greek: *mesos*, middle; *stoma*, mouth in allusion to the place of the apertura removed from the distal border of the mural rim.

The ovicell is endotoichal; it is convex and its orifice is large and placed obliquely above the apertura. The apertura is removed from the distal border of the mural rim and surrounded by a special peristome; it is deprived of denticles. The zooecia are arranged in transverse rows.

Genotype.—*Mesostomaria strictoramae*, new species. (Pl. 1, fig. 4.)

Range.—Miocene. Recent.

Suborder ASCOPHORA Levinsen

Family MEMBRANICELLARIIDAE Levinsen, 1909

Genus OMOIOSIA, new genus

The zooecia are hexagonal. The opesium perforates the cryptocyst and is bordered by a salient thread. The accessory zooecia (onychocellaria?) are quite similar to the others, but the distal portion of their cryptocyst is much larger.

Genotype.—*Omoiosia* (*Vincularia*) *maorica* Stoliczka, 1864.

Range.—Miocene. Recent.

Genus ERINELLA, new name

Proposed in place of *Erina* Canu, 1908, preoccupied by Swains in 1833.

Genotype.—*E. patagonica* Canu, 1908. Patagonia.

Family PETRALIIDAE Levinsen, 1909

Genus PETRALIELLA, new genus

The ovicell is hyperstomial, never closed by the operculum, buried in the distal zooecium. The shieldlike area is very well developed but irregularly around the aperture; it is very often bipartite and bears almost always two small lateral avicularia; in its proximal portion a large avicularian umbo often appears. 25 tentacles.

Genotype.—*Petraliella* (*Escharella*) *bisinuata* Smitt, 1872.

Range.—Miocene—Recent.

Genus COLEOPORA, new genus

Greek: *coleos*, sheath, in allusion to the development of the shield.

The ovicell is hyperstomial and never closed by the operculum. The shield thickens at the top and forms around and above the peristome a tubuuar very salient peristomie; neither lyrula nor cardelles present.

Genotype.—*Coleopora verrucosa*, new species. Recent. (Pl. 1, fig. 7.)

Frequently the peristome is visible at the bottom of the peristomie formed by the shield which serves thus as a sheath.

Family GALEOPSIDAE Jullien, 1903

Genus COSCINIOPSIS, new genus

Greek: *coscinion*, small sieve, referring to the frontal.

The ovicell is hyperstomial, closed by the operculum and porous like the frontal. The aperture bears two cardelles placed low. The frontal is a tremocyst. The operculum bears two large lateral bands; the two muscular attachments are removed from the border.

Genotype.—*Cosciniopsis coelatus*, new species. Recent. (Pl. 1, fig. 8.)

Genus STENOPSIS, new genus

Greek: *stenos*, narrow, in allusion to the form of the peristomie.

The ovicell is hyperstomial. The aperture is rounded-quadrangular, without cardelles. The peristomie is elongated. The spiramen is broad and salient. The frontal is a tuberose tremocyst. The operculum is thin, semielliptical and without muscular attachments. Avicularia are present.

Genotype.—*Stenopsis* (*Porina*) *fenestrata* Smitt, 1872.

Range.—Eocene (Jacksonian)—Recent.

Family STOMACHETOSELLIDAE Canu and Bassler, 1920

Genus CIGCLISULA, new genus

Greek: *cigclis*, grating, in allusion to the aspect of the ovicell.

The ovicell is hyperstomial, opening in the peristomie, never closed by the operculum, with the frontal perforated by very large pores. The frontal is a thick tremocyst with tubules. The apertura is oval; the peristomice bears a wide pseudorimule bordered by a peristomial avicularium. The operculum bears two large lateral bands terminated by two strong muscular attachments. There are large

sporadic interzooecial avicularia. 17–19 tentacles. Special oral glands.

Genotype.—*Cigclisula* (*Escharoides*) *occlusa* Busk, 1884. Recent.

Genus RAGIONULA, new genus

Greek: *ragion*, small grains, in reference to the aspect of the frontal.

The ovicell is hyperstomial, opening into the peristomie, not closed by the operculum. The frontal is (in appearance) a very thick, granular pleurocyst. The apertura is semicircular. The peristomice bears a pseudorimule bordered by a small eccentric peristomial avicularium. The operculum and the mandible are of the type of *Porella.*

Genotype.—*Ragionula* (*Eschara*) *rosacea* Busk, 1856. Recent.

Genus DIATOSULA, new genus

Greek: *diatos*, having two handles, referring to the aspect of the zooecium.

The ovicell is hyperstomial and opens in the peristomie; it bears a triangular area bordered with pores. The frontal is very thick and smooth. The apertura is formed of a large anter separated from the small poster by two cardelles. The peristomice bears a pseudorimule limited laterally by two peristomial avicularia more or less salient and visible. On the frontal a large spathulated avicularium sometimes appears.

Genotype.—*Myriozoum marionense* Busk, 1884. Recent.

Family ESCHARELLIDAE Levinsen, 1909

Genus GEMELLIPORIDRA, new genus

The ovicell is hyperstomial and is always closed by the operculum. The frontal and the ovicell are covered by tremopores. The aperture bears two small lateral indentations separating a very large suborbicular anter from a very small concave poster. The operculum bears two lateral marks corresponding to oral indentations and two linear muscular attachments. There are two oral avicularia irregularly arranged on each side of the aperture. The complete colonies are multilamellar and the zooecia are then poorly oriented.

Genotype.—*Gemelliporidra typica* new species. Recent. (Pl. 1, fig. 9.)

Range.—Pleistocene. Recent.

Genus HIPPOPLEURIFERA, new genus

The ovicell is hyperstomial and is not closed by the operculum. The frontal bears at least a double row of areolar pores separated

by radial costules. The cardelles are small. There are spines on the peristome and zooecial avicularia in which the beak is always oriented toward the top of the zooecia.

Genotype.—Hippopleurifera (*Eschara*) *sedgwicki* Milne-Edwards, 1838.

Range.—Miocene (Helvetian)—Recent.

Genus BUFFONELLARIA, new genus

The ovicell is hyperstomial and not closed by the operculum. The frontal is an olocyst with vein-like markings. There is a small oral avicularium.

Genotype.—Hippothoa divergens Smitt, 1873. Recent.

Family ADEONIDAE Jullien, 1903

Genus TRIPORULA, new genus

The apertura is semicircular. The peristomice is elliptical and transverse. The frontal is covered by stellate pores, each placed in a polygonal area. There are three avicularia adjacent to the aperture, two proximal with the beak oriented superiorily and one distal with the beak oriented inferiorily. No spines. No ovicell.

Genotype.—Triporula (*Escharipora*) *stellata* Smitt, 1873.

Range.—Miocene. Recent.

Family PHYLACTELLIDAE Canu and Bassler, 1917

Genus PSILOPSELLA, new genus

Greek: *psilos*, unadorned, in allusion to the smooth frontal.

The zooecia are large and surrounded by parietal dietellae; the frontal is bordered with large areolar pores distinct from the dietellae. The aperture is orbicular and buried at the bottom of a long peristomie.

Genotype.—Psilopsella uniseriata, new species. Recent. (Pl. 1, fig. 10.)

Family CELLEPORIDAE Busk, 1852

Genus HIPPOPORIDRA, new genus

The ovicell is hyperstomial and bears a frontal area. The zooecia are accumulated; the frontal is surrounded by areolar pores and often bears small avicularia. The aperture is formed of an anter and a poster separated by two cardelles. The large interzooecial avicularia are acuminated.

Genotype.—Hippoporidra (*Cellepora*) *edax* Busk, 1959.

Range.—Miocene—Recent.

Genus HIPPOTREMA, new genus

Greek: *hippos*, horse; *trema*, perforation, in reference to the form of the aperture.

The ovicell is hyperstomial and is not closed by the operculum. The zooecia are piled upon each other in disorder; their frontal is perforated by tremopores. The aperture is formed by a large orbicular anter and by a short poster, separated by two cardelles. The operculum does not have lateral linear attachments.

Genotype.—Hippotrema (*Lepralia*) *janthina* Smitt, 1873. Recent

This is the *Cellepora janthina* group of Waters of which we have published a text figure (Canu and Bassler, 1920, p. 615, fig. 185). The genus differs from *Hippoporidra* in the transformation of the pleurocyst into a tremocyst, in the different form of the poster and in the absence of linear attachments to the operculum.

Family CATENICELLIDAE Busk, 1852

Genus CRIBRICELLINA, new name

Proposed to replace *Cribricella* Levinsen, 1909, preoccupied by Canu, 1902.

Genotype.—Catenicella rufa MacGillivray, 1868. Recent.

Genus CORNUTICELLA, new genus

The tuberculate imperforate ovicell is at the end of a mother zooecium of a globulus. Vittae.

Genotype.—Cornuticella (*Catenicella*) *cornuta* Busk, 1852. Recent.

Suborder HEXAPOGONA, new suborder.

Greek: *apogonos*, descending

The ancestrula engenders six zooecia regularly erect.

The families belonging to this suborder of cheilostomatous bryozoa are the Chaperiidae Jullien, 1888, Conescharellinidae Levinsen, 1909, Mamilloporidae, new family and doubtfully the Myriozoumidae Smitt, 1867, and Lekythoporidae MacGillivray, 1882.

We class here *Myriozoum* by simple cell analogy, but the ancestrula has not yet been published. Of the Lekythoporidae we know only the ancestrula of the genus *Actisecos* and we are not certain that the family is a very natural one.

Family MAMILLOPORIDAE, new family

Hexapogona with orbicular zoarium without pit. The cells are juxtaposed. The proximal border of the apertura is oriented

toward the apex. The ovicell is a special interzooecial cavity and is closed by the operculum.

We believe that the genera of the old family, Conescharellinidae, can be separated into two groups. The first is one rich in species with very frequent ovicells; the second comprises the species with very rare ovicells. It is very difficult to conceive that their larvae are identical. Moreover, *Conescharellina* with its distal sinus and its inferior aperture is certainly of very different anatomical structure.

The genera of this family are *Mamillopora* Smitt, 1872, *Fedora* Jullien, 1881, *Anoteropora*, new genus and *Stenosipora*, new genus.

According to Waters, 1919, it is necessary to class with *Mamillopora* the ancient genera *Discoflustrellaria* D'Orbigny, 1852 (part); *Kionidella* Koschinski, 1875, and *Prattia* D'Archiac, 1847.

Genus ANOTEROPORA, new genus

Greek: *anoteros*, superior; *poros*, pore, referring to the place of the avicularium.

The zoarium is cupuliform. The inferior side of each zooecium is porous. The superior side is convex, perforated proximally by the apertura and decorated distally by a triangular avicularium arranged transversely. The aperture is elliptical with two submedian cardelles. The ovicelled zooecia are much larger and their aperture is transverse; the ovicell is very large, occupying the place of a zooecium and closed by the operculum.

Genotype.—*Anoteropora magnicapitata* new species. (Pl. 1, fig. 11.)

Range.—Pliocene. Recent.

Genus STENOSIPORA, new genus

The zoarium is cupuliform. The inferior base of each zooecium is hexagonal and porous. The superior base is little convex, perforated in the middle by the aperture and often decorated laterally by one or two avicularia. The aperture is elliptical with two cardelles placed more or less low. The ovicell is hyperstomial, closed by the operculum, embedded in the distal zooecium; the ovicelled zooecia are no larger than the others.

Genotype.—*Stenosipora* (*Stichoporina*) *protecta* Koschinsky, 1885.

Range.—Eocene (Lutetian, Priabonian).

Family CONESCHARELLINIDAE Levinsen, 1909

The zooecia are prismatic, hexagonal, and rising above two hexagonal pyramids attenuated or potential. The aperture has a distal sinus and is accompanied by a proximal pore. The colonies are free and floating.

The known genera of this family are *Flabellopora* D'Orbigny, 1852, *Conescharellina* D'Orbigny, 1852, *Trochosodon*, new genus, *Bipora* Whitelegge, 1887, and *Zeuglopora* Maplestone, 1909.

Genus TROCHOSODON, new genus

Greek: *troches*, wheel; *odon*, tooth, in allusion to the aspect of the base.

The zooecia are not entirely covered and are separated by pores; the base is crenulated by the last formed row of zooecia. Interzooecial pores are present.

Genotype.—Trochosodon linearis, new species. Recent. (Pl. 1, fig. 12.)

This new genus differs from *Conescharellina* in the absence of avicularia, in convex instead of perfectly conical zoaria and in the zooecia which present a visible portion.

Family LEKYTHOPORIDAE Levinsen, 1909

Genus ACTISECOS, new genus

Greek: *actis* ray; *secos* small case or cell, in reference to the radiated arrangement of the zooecia.

The zooecia are tubular, swollen at their base; the frontal is a tremocyst with very small pores. The ovicell is peristomial and placed on the dorsal. The aperture is ogival and buried at the bottom of a long peristomie. The base of the zooecia is hexagonal.

Genotype.—Actisecos regularis, new species. Recent. (Pl. 1, fig. 13.)

This genus very much resembles *Ascosia* Jullien, 1881, but differs from it in having six cells around the ancestrula, in the absence of oral avicularia and in the peristomial and not recumbent ovicells.

Genus CATADYSIS, new genus

Greek: *catadysis*, hiding place; in allusion to the ovicell.

The ovicell is hyperstomial, buried in the interior of the zooecial walls, opening in the inferior part of the peristomie. The zooecia are indistinct; the frontal is striated longitudinally; the walls much thickened, are formed by a tremocyst with very small tubules. The apertura is hidden at the bottom of the peristomie and bears a proximal tongue. In the peristomie there are very small triangular avicularia.

Genotype.—Catadysis (*Schizoporella*) *challengeriana* Waters, 1888. Recent.

Genus ORTHOPORIDRA, new name

Proposed for *Orthopora* Waters, 1904, preoccupied among Paleozoic bryozoa.

Genotype.—Orthopora compacta Waters, 1904. Recent.

SYSTEMATIC CLASSIFICATION OF CHEILOSTOMATA

Order CHEILOSTOMATA Busk

Suborder ANASCA Levinsen

Division 1. MALACOSTEGA Levinsen, 1909

Family BIFLUSTRIDAE Smitt, 1872

Acanthodesia Canu and Bassler, 1920; *Cupuladria* Canu and Bassler, 1919; *Adenifera* Canu and Bassler, 1917; *Trochopora* D'Orbigny, 1853; (*Heteractis* Gabb and Horn, 1862); *Otionella* Canu and Bassler, 1917; *Heliodoma* Calvet, 1907; *Conopeum* Norman, 1903; *Quadricellaria* D'Orbigny, 1851; *Cellarinidra*, new name (*Cellarina* D'Orbigny, 1851, preoccupied); *Membranipora* Blainville, 1830 and *Membraniporina* Levinsen, 1909 (artificial group for unplaced Membraniporae); *Biflustra* D'Orbigny, 1852 (a general term of no generic value); *Pseudostega* Brydone, 1918.

Family ELECTRINIDAE D'Orbigny, 1851

Nitscheina Canu, 1900, *Electra* Lamouroux, 1816 (*Electrina* and *Reptelectrina* D'Orbigny, 1851, *Annulipora* Gray, 1848); *Pyripora* D'Orbigny, 1852; *Heterooecium* Hincks, 1892; *Herpetopora* Lang, 1914; *Tretosina*, new genus; *Mystriopora* Lang, 1915; *Tendra* Nordman, 1839; *Aspidelectra* Levinsen, 1909; *Taphrostoma* Canu, 1905; *Rhammatopora*, *Charixa*, and *Distelopora*, all of Lang, 1915, are placed here with doubt.

Family FLUSTRIDAE Smitt, 1867

Flustra Linnaeus, 1761 (subgenera *Carbasea* Gray, 1848 and *Chartella* Gray, 1848); *Sarsiflustra* Jullien, 1903; *Spiralaria* Busk, 1861; *Retiflustra* Levinsen, 1909; *Kenella* Levinsen, 1909; *Heteroflustra* Levinsen, 1909 (artificial group for unplaced Flustridae).

Family HINCKSINIDAE, new family

Hincksina Norman, 1903; *Membrendoecium* Canu and Bassler, 1917; *Biselenaria* Gregory, 1893 (*Diplotaxis* Reuss, 1867, preoccupied); *Setosellina* Calvet, 1906; *Aplousina*, new genus; *Cribrendoe-*

cium Canu and Bassler, 1917; *Ogivalina* Canu and Bassler, 1917; *Vibracellina* Canu and Bassler, 1917; *Antropora* Norman, 1903.

Family FARCIMINARIIDAE Busk, 1884

Nellia Busk, 1852; *Levinsenella* Harmer, 1926 (*Columnaria* Levinsen, 1909, preoccupied); *Farciminaria* Busk, 1852; *Farciminellum* Harmer, 1926; *Didymozoum* Harmer, 1923 (*Didymia* Busk, 1852, preoccupied).

Family ALDERINIDAE, new family

Callopora Gray, 1848, (subgenera *Doryporella* Norman, 1903; *Copidozoum* Harmer, 1926); *Amphiblestrum* Gray, 1848 (*Bathypora* MacGillivray, 1895); *Alderina* Norman, 1903; *Marssonopora* Lang, 1914; *Crassimarginatella* Canu, 1900 (*Grammella* Canu, 1917, *Oochilina* Norman, 1903); *Cauloramphus* Norman, 1903; *Membraniporella* Smitt, 1873; *Tegella* Levinsen, 1909; *Ramphonotus* Norman, 1894 (*Rhynchotella* Canu, 1900); *Stamenocella* Canu and Bassler, 1917; *Ammatophora* Norman, 1903; *Periporosella* Canu and Bassler, 1917; *Ellisina* Norman, 1903; *Membraniporidra* Canu and Bassler, 1917; *Larnacius* Norman, 1903; *Foveolaria* Busk, 1883; *Cribrilina* Gray, 1848; *Acanthocella* Canu and Bassler, 1917; *Gephyrotes* Norman, 1903; *Allantopora* Lang, 1914; *Frurionella* Canu and Bassler, 1927; *Euritina* Canu, 1900; *Marginaria* Roemer, 1841; *?Pithodella* Marsson, 1887; *Pyriporella* Canu, 1911; *Pyrulella* Harmer, 1926; *Valdemunitella* Canu, 1900.

Family BUGULIDAE Gray, 1848

Bugula Oken, 1815 (*Bugulina* Gray, 1848, *Ornithopora* D'Orbigny, 1852, *Acamarchis* Lamouroux, 1816, *Avicella* Van Beneden, 1848; *Avicularia* Gray, 1848; *Crisularia* Gray, 1848; *Ornithoporina* D'Orbigny, 1852); *Dendrobeania* Levinsen, 1909; *Watersia* Levinsen, 1909; *Himantozoum* Harmer, 1923; *Caulibugula* Verrill, 1900 (*Stirpariella* Harmer, 1923, *Stirparia* Goldstein, 1880, preoccupied); *Camptoplites* Harmer, 1923; *Bugularia* Levinsen, 1909; *Euoplozoum* Harmer, 1923; *Kinetoskias* Danielsen, 1868 (*Naresia* Wyville Thompson, 1873); *Halophila* (Gray, 1843) Busk, 1852.

Family SCRUPOCELLARIIDAE Levinsen, 1909

Scrupocellaria Van Beneden, 1845; *Canda* Lamouroux, 1816; *Caberea* Lamouroux, 1816 (*Selbia* Gray, 1843); *Amastigia* Busk, 1852 (*Anderssonia* Kluge, 1914; *Caberiella* Levinsen, 1909); *Flabellaris* Waters, 1898 (*Craspedozoum* MacGillivray, 1895); *Hoplitella* Levinsen, 1909; *Rhabdozoum* Hincks, 1882; *Notoplites* Harmer, 1923;

Jubella Jullien, 1882; *Tricellaria* Fleming, 1828 (*Ternicellaria* D'Orbigny, 1851; *Bugulopsis* Verrill, 1880); *Menipea* Lamouroux, 1816 (*Emma* Gray, 1843); *Maplestonia* MacGillivray, 1884.

Family SYNAPTACELLIDAE, Maplestone, 1911

Synaptacella Maplestone, 1911; *Heterocella* Canu, 1907.

Family HIANTOPORIDAE MacGillivray, 1895

Tremopora Ortmann, 1890; *Hiantopora* MacGillivray, 1887 (*Membrostega* Jullien, 1903); *Tremogasterina* Canu, 1911; *Hoplocheilina* Canu, 1911.

Family BICELLARIELLIDAE Levinson, 1909

Bicellariella Levinsen, 1909 (*Bicellaria* Blainville, 1830, preoccupied); *Dimetopia* Busk, 1852; *Cornucopina* Levinsen, 1909; *Petalostegus* Levinsen, 1909; *Bicellarina* Levinsen, 1909; *Dimorphozoum* Levinsen, 1909; *Calyptozoum* Harmer, 1926.

Family BEANIIDAE, new family

Beania Johnston, 1848 (*Chaunosia* Busk, 1867); subgenus *Diachoris* Busk, 1852; *Stolonella* Hincks, 1883.

Family SCRUPARIIDAE Busk, 1852

Scruparia Oken, 1815; *Eucratea* (Lamouroux, 1812) Hincks, 1880 (*Notamia* Fleming, 1828, preoccupied, *Gemellaria* Van Beneden, 1845); *Brettia* Dyster, 1858; *Corynoporella* Hincks, 1888; *Bugulella* Verrill, 1879.

Family EPISTOMIIDAE Gregory, 1903

Epistomia Fleming, 1828; *Synnotum* (Pieper, 1881) Hincks, 1886.

Family AETEIDAE Smitt, 1867

Aetea Lamouroux, 1812 (*Aeteopsis* Boeck, 1862; *Filicella* Searles Wood, 1844; *Anguinaria* Lamarck, 1816; *Cercaripora* Fischer, 1866; *Salpingia* Coppin, 1848).

Division 2. COILOSTEGA Levinsen, 1909

Family OPESIULIDAE Jullien, 1888

Subfamily Onychocellidae Jullien, 1881; *Onychocella* Jullien, 1881; *Rectonychocella* Canu and Bassler, 1917; *Velumella* Canu and Bassler, 1917 (*Diplopholeos* Canu and Bassler, 1917); *Floridina*

Jullien, 1881; *Smittipora* Jullien, 1881; *Ogiva* Jullien, 1886; *Ogivalia* Jullien, 1886.

Subfamily Microporidae Hincks, 1880; *Rosseliana* Jullien, 1888; *Floridinella* Canu and Bassler, 1917; *Gargantua* Jullien, 1888; *Dacryonella* Canu and Bassler, 1917; *Aechmella* Canu and Bassler, 1917; *Homalostega* Marsson, 1887; *Micropora* Gray, 1848 (*Peneclausa* Jullien, 1888); *Nematoporella*, new name (*Nematopora* Duvergier, 1921, preoccupied); *Caleschara* MacGillivray, 1880; *Monsella* Canu, 1900; *Selenaria* Busk, 1854; *Vibracella* Waters, 1891; *Andreella* Jullien, 1888; *Selenariopsis* Maplestone, 1912.

Subfamily Lunulariidae Levinsen, 1909; *Lunularia* Busk, 1884 (*Lunulites* Authors, part; *Oligotresium* Gabb and Horn, 1862; *Dimiclausa* Gregorio, 1890).

Family CALPENSIIDAE Canu and Bassler, 1923

Microporina Levinsen, 1909; *Cupularia* Lamouroux, 1821; *Hemiseptella* Levinsen, 1909; *Diplodidymia* Reuss, 1869 (*Poricellaria* D'Orbigny, 1852); *Calpensia* Jullien, 1888; *Verminaria* Jullien, 1888; *Corynostylus* Canu and Bassler, 1919.

Family STEGANOPORELLIDAE Hincks, 1884

Steganoporella Smitt, 1873; *Siphonoporella* Hincks, 1880; *Labioporella* Harmer, 1926 (*Labiopora* Levinsen, 1909, preoccupied); *Gaudryanella* Canu, 1907.

Family THALAMOPORELLIDAE Levinsen, 1902

Thalamoporella Hincks, 1887; *Thairopora* MacGillivray, 1882 (*Diplopora* MacGillivray, 1881; *Diploporella* MacGillivray, 1885; *Pergensina* Jullien, 1888); *Manzonella* Jullien, 1888; *Woodipora* Jullien, 1888.

Family ASPIDOSTOMIDAE Jullien, 1888

Monoporella Hincks, 1881 (*Haploporella* Hincks, 1881, *Chrossotoechia* Canu, 1925); *Macropora* MacGillivray, 1895; *Odontionella* Canu and Bassler, 1917; *Foraminella* Levinsen, 1909; *Rhagasostoma* Koschinsky, 1885; *Aspidostoma* Hincks, 1881; ? *Megapora* Hincks, 1877; *Mollia* Lamouroux, 1821.

Family SETOSELLIDAE Levinsen, 1909

Setosella Hincks, 1877; *Crateropora* Levinsen, 1909; *Entomaria* Canu, 1921 (*Lagarozoum* Harmer, 1926).

Family ARACHNOPUSIIDAE Jullien, 1888

Exechonella, new genus; *Arachnopusia* Jullien, 1886.

Family CHILIDONIIDAE Busk, 1884

Chlidonia (Savigny, 1811) Lamouroux, 1824 (*Cothurnicella* Wyville Thompson, 1858); *Crepis* Jullien, 1883.

Family ALYSIDIIDAE Levinsen, 1909

Alysidium Busk, 1852; *Catenariopsis* Maplestone, 1899; *Catenicula* O'Donoghue, 1924.

Division 3. PSEUDOSTEGA Levinsen, 1909

Family CELLARIIDAE Hincks, 1880

Cellaria (Ellis and Solander, 1786) Lamouroux, 1812 (*Salicornaria* Schweigger, 1819, *Farcimia* Fleming, 1828); *Cryptostomaria*, new genus; *Melicerita* Milne-Edwards, 1836 (*Ulidium* Searles Wood, 1844); *Euginoma* Jullien, 1882; *Stomhypselosaria*, new genus; *Mesostomaria*, new genus; *Escharicellaria*, Voigt 1924; *Atelestozoum* Harmer, 1926; *Syringotrema* Harmer, 1926.

Family MEMBRANICELLARIIDAE Levinsen, 1909

Membranicellaria Levinsen, 1909; *Dictuonia* Jullien, 1881; *Erinella*, new name (*Erina* Canu, 1908 preoccupied); *Omoiosia*, new genus.

Family COSCINOPLEURIDAE Canu, 1913

Coscinopleura Marsson, 1887; *Escharifora* D'Orbingy, 1852.

Suborder ASCOPHORA Levinsen, 1909

Family COSTULAE Jullien, 1888

Collarina Jullien, 1888; *Decurtaria* Jullien, 1886; *Lyrula* Jullien, 1888; *Costula* Jullien, 1886; *Barroisina* Jullien, 1886; *Scorpiodina* Jullien, 1886; *Colletosia* Jullien, 1886; *Mumiella* Jullien, 1886; *Steginopora* D'Orbigny, 1851 (subgenera *Ubaghsia* Jullien, 1886; *Thoracophora* Jullien, 1886); *Murinopsia* Jullien, 1880 (*Lagodiopsis* Marsson, 1887); *Puellina* Jullien, 1886; *Metracolposa* Canu and Bassler, 1917; *Kelestoma* Marsson, 1887; *Distanseschareila* D'Orbigny, 1852; *Corbulipora* MacGillivray, 1895; *Figularia* Jullien, 1886, *Reginella* Jullien, 1886; *Jolietina* Jullien, 1886; *Pliophloea* Gabb and Horn, 1862; *Pleuroschiziella* Canu, 1918; *Lepralina* Kühn, 1925.

Family MYAGROPORIDAE Lang, 1916 [5]

Myagropora Lang, 1916.

Family OTOPORIDAE Lang, 1916 [5]

Otopora, *Anotopora* and *Anaptopora*, all of Lang, 1916.

Family CTENOPORIDAE Lang, 1916 [5]

Ctenopora Lang, 1916.

Family THORACOPORIDAE Lang, 1916 [5]

Thoracopora Lang, 1916.

Family TARACTOPORIDAE Lang, 1916 [5]

Taractopora Lang, 1916.

Family LAGYNOPORIDAE Lang, 1916 [5]

Hexacanthopora, *Prodromopora*, *Lagynopora*, *Leptocheilopora*, all of Lang, 1916.

Family ANDRIOPORIDAE Lang, 1916 [5]

Andriopora, *Corymboporella*, *Polyceratopora*, *Argopora*, *Nannopora*, *Angelopora*, *Eucheilopora*, *Kankopora*, *Oligotopora*, *Tricolpopora*, *Monoceratopora*, *Hybopora*, *Hippiopora*, *Æolopora*, *Auchenopora*, *Pancheilopora*, *Holostegopora*, *Trilophopora*, *Schistacanthopora*, all of Lang, 1916. *Lekythoglena* Marsson, 1887. *Pliophlœa* Gabb and Horn, 1863, *Distansescharella* D'Orbigny, 1853.

Family CALPIDOPORIDAE Lang, 1916 [5]

Calpidopora, *Rhabdopora*, *Graptopora*, all of Lang, 1916.

Family DISHELOPORIDAE Lang, 1916 [5]

Dishelopora, *Hystricopora* Lang, 1916.

Family RHACHEOPORIDAE Lang, 1916 [5]

Rhacheopora, *Prosotopora*, *Geisopora*, *Diancopora*, *Diceratopora*, all of Lang, 1916.

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[5] The families so marked contain the many Cretaceous cribrimorph genera founded mainly by Lang. We have had no opportunity to study these genera and they are included at this point to complete the generic list.

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Family PELMATOPORIDAE Lang, 1916 [5]

Francopora, *Baptopora*, *Opisthornithopora*, *Morphasmopora*, *Tricephalopora*, *Haplocephalopora*, *Phractoporella*, *Polycephalopora*, *Coelopora*, *Pnictopora*, *Carydiopora*, *Anornithopora*, *Hesperopora*, *Rhiniopora*, *Phrynopora*, *Castanopora*, *Diacanthopora*, *Pelmatopora*, *Sandalopora*, *Ichnopora*, *Batrachopora*, all of Lang, 1916. *Decurtaria* Jullien, 1886 (*Prosoporella* Marsson, 1887), *Murinopsia* Jullien, 1886 (*Lagodiopsis* Marsson, 1887), *Pachydera* Marsson, 1887, *Disteginopora* D'Orbigny, 1852, *Ubaghsia* Jullien, 1886, *Stichocados* Marsson, 1887, *Kelestoma* Marsson, 1887, *Steginopora* D'Orbigny,

Family ACROPORIDAE Canu, 1913

Acropora Reuss, 1869; *Gastropella* Canu and Bassler, 1917; *Pachytheca* Canu, 1913; *Beisselina* Canu, 1913; *Columnotheca* Marsson, 1887.

Family CYCLICOPORIDAE Hincks, 1884

Cyclicopora Hincks, 1884; *Kymella* Canu and Bassler, 1917.

Family EUTHYROIDAE Levinsen, 1909

Euthyroides Harmer, 1902.

Family HIPPOTHOIDAE Levinsen, 1909

Hippothoa (Lamouroux, 1821) Hincks, 1880 (*Diazeuxia* Jullien, 1886; *Celleporella* Gray, 1848); *Trypostega* Levinsen, 1909; *Chorizopora* Hincks, 1880; *Haplopoma* Levinsen, 1909; *Dacryopora* Lang, 1914; *Harmeria* Norman, 1903.

Family PETRALIIDAE Levinsen, 1909

Petralia MacGillivray, 1887; *Petraliella*, new genus; *Coleopora*, new genus.

Family GALEOPSIDAE Jullien, 1903

Galeopsis Jullien, 1903; *Cosciniopsis*, new genus; *Stenopsis*, new genus; *Gephyrophora* Busk, 1884; *Haswellia* Busk, 1884; *Pachystomaria* MacGillivray, 1895; *Schizaropsis* Canu and Bassler, 1917; *Cylindroporella* Hincks, 1877 (*Porinula* Levinsen, 1916); *Gigantopora* Ridley, 1881; *Tremotoichos* Canu and Bassler, 1917; *Semihaswellia* Canu and Bassler, 1917; *Tessaradoma* Norman, 1868.

Family STOMACHETOSELLIDAE Canu and Bassler, 1917

Posterula Jullien, 1903; *Stomachetosella* Canu and Bassler, 1917; *Enoplostomella* Canu and Bassler, 1917; *Cigclisula*, new genus; *Ragionula*, new genus; *Diatosula*, new genus; *Leiosella* Canu and

Bassler, 1917; *Schizemiella* Canu and Bassler, 1917; *Metradolium* Canu and Bassler, 1917; *Metrocrypta* Canu and Bassler, 1917; *Ochetosella* Canu and Bassler, 1917; *Escharoides* Milne-Edwards, 1836.

Family ESCHARELLIDAE Levinsen, 1909

Subfamily Schizoporellae Canu and Bassler, 1917; *Schizolavella* Canu and Bassler, 1920; *Stylopoma* Levinsen, 1909; *Dakaria* Jullien, 1903; *Emballotheca* (part) Levinsen, 1909; *Gemellipora* Smitt (part) 1872; *Gemelliporella* Canu and Bassler, 1920; *Gemelliporidra*, new genus; *Characodoma* Maplestone, 1900; *Lacerna* Jullien, 1888; *Arthropoma* Levinsen, 1909; *Buffonellaria*, new genus; *Schizomavella* Canu and Bassler, 1920 (subgenus *Metroperiella* Canu and Bassler, 1917); *Schizoporella* Hincks, 1877; *Stephanosella* Canu and Bassler, 1917; *Stephanallona* Duvergier, 1921; *Schizopodrella* Canu and Bassler, 1917; *Buffonella* Jullien, 1888; *Phonicosia* Jullien, 1888; *Schizobrachiella* Canu and Bassler, 1920; *Strophiella* Jullien, 1903; *Sphenella* Duvergier, 1924; *?Trypocella* Maplestone, 1902.

Subfamily Hippoporae Canu and Bassler, 1917; *Hippoporina* Neviani, 1895; *Hippopleurifera*, new genus; *Hippoporella* Canu and Bassler, 1920; *Hippoponella* Canu and Bassler, 1920; *Hippomenella* Canu and Bassler, 1917; *Hippodiplosia* Canu, 1916; *Hippozeugosella* Canu and Bassler, 1917; *Hippadenella* Canu and Bassler, 1917; *Lepralia* Johnston, 1847; *Cryptosula* Canu and Bassler, 1925.

Subfamily Peristomellae Canu and Bassler, 1917; *Bathosella* Canu and Bassler, 1917; *Romancheina* Jullien, 1888; *Peristomella* Levinsen, 1902; *Exochella* Jullien, 1888; *Didymosella* Canu and Bassler, 1917; *Trypematella* Canu and Bassler, 1920.

Subfamily Microporellae Canu and Bassler, 1917; *Microporella* Hincks, 1877 (subgenera *Diporula* Hincks, 1879, *Ellipsopora* Canu and Bassler, 1923 and *Flustramorpha* Gray, 1848); *Fenestrulina* Jullien, 1888; *Calloporina* Neviani, 1895; *Stephanopora* Kirkpatrick, 1888.

Divers genera: *Cyclocolposa* Canu and Bassler, 1920; *Cycloperiella* Canu and Bassler, 1920; *Aimulosia* Jullien, 1888; *Houzeauina* Pergens, 1889; *Pseudoflustra* Bidenkap, 1897.

Family EURYSTOMELLIDAE Levinsen, 1909

Eurystomella Levinsen, 1909.

Family SMITTINIDAE Levinsen, 1909

Smittina Norman, 1903 (*Smittia* Hincks, 1880; subgenus *Reussia* Neviani, 1895); *Mucronella* Hincks, 1880; *Porella* Gray, 1848; (*Marsillea* Neviani, 1895; *Levinseniula* Cossman, 1920); *Palmicellaria*

Alder, 1864; *Rhamphostomella* Lorenz, 1886; *Cystisella* Canu and Bassler, 1917; *Plagiosmittia* Canu and Bassler, 1917; *Umbonula* Hincks, 1880 (*Umbonella* Hincks, 1880, preoccupied); *Phoceana* Jullien, 1903; *Bryocryptella* Cossman, 1906 (*Cryptella* Jullien, 1903, preoccupied); *Malleatia* Jullien, 1903; *Marguetta* Jullien, 1903; *Jaculina* Jullien and Calvet, 1903 (*Vibraculina* Neviani, 1895).

Family TUBUCELLARIIDAE Busk, 1884

Tubucellaria D'Orbigny, 1852; *Tubucella* Canu and Bassler, 1917; *Tubiporella* Levinsen, 1909; *Siphonicytara* Busk, 1884.

Family RETEPORIDAE Smitt, 1867

I. *Retepora* Imperato, 1599 (subgenera *Reteporella* Busk, 1884, and *Sertella* Jullien, 1903); *Schizellozoon* Canu and Bassler, 1917; *Triphyllozoon* Canu and Bassler, 1917; *Phidolopora* Gabb and Horn, 1862; *Rhynchozoon* Hincks, 1891 (*Rhynchopora* Hincks, 1877, preoccupied); *Lepraliella* Levinsen, 1916; *Hippellozoon* Canu and Bassler, 1917; *Schizotheca* Hincks, 1877; *Schizoretepora* Gregory, 1893.

II. *Caberoides* Canu, 1900; *Psileschara* Busk, 1860; *Plagiopora* MacGillivray, 1895; *Sparsiporina* D'Orbigny, 1851; *Bulbipora* MacGillivray, 1895.

Family ADEONIDAE Jullien, 1903

Adeona (Lamouroux, 1816) Levinsen, 1909; *Bracebridgia* MacGillivray, 1886 (*Poristoma* Canu, 1907); *Laminopora* Michelin, 1842; *Anarthropora* Smitt, 1867; *Adeonella* (Busk, 1884) Waters, 1888 (*Reussina* Neviani, 1895); *Adeonellopsis* MacGillivray, 1886 (*Ovaticella* Maplestone, 1902), subgenera *Lobopora* Levinsen, 1909 (*Cribricella* Canu, 1904) and *Poricella* Canu, 1904; *Dimorphocella* Maplestone, 1903; *Triporula*, new genus; *Meniscopora* Gregory, 1903; *Metrarabdotos* Canu, 1914; *Schizostomella* new name (*Schizostoma* Canu, 1907, not Lea, 1842); *Smittistoma* Canu, 1907; *Calvetina* Canu, 1907; *Inversiula* Jullien, 1888; *Cyclostomella* Ortmann, 1890.

Family HIPPOPODINIDAE Levinsen, 1909

Cheilopora Levinsen, 1909; *Cheiloporina* Canu and Bassler, 1923; *Tremoschizodina* Duvergier, 1921; *Hippaliosina* Canu, 1918; *Tetraplaria* Tenison-Wood, 1878 (*Bigemellaria* MacGillivray, 1895; *Arborella* Osburn, 1914); *Pollaploecium* Maplestone, 1909; *Diploecium* Kirkpatrick, 1888; *Hippopodina* Levinsen, 1909; *Watersipora* Neviani, 1895; *Cianotremella* Canu, 1911; *Hippopodinella* Barroso, 1924; *Cucullipora* MacGillivray, 1895.

Family PARMULARIIDAE Maplestone, 1912

Parmularia Maplestone, 1910; *Lanceopora* D'Orbigny, 1851; ?*Bathystoma* Marsson, 1887.

Family PHYLACTELLIDAE Canu and Bassler, 1917

Perigasterella Canu and Bassler, 1917; *Lagenipora* Hincks, 1877; *Psilopsella*, new genus; *Alysidota* Busk, 1866; *Phylactella* Hincks, 1880; *Temachia* Jullien, 1882; *Hemicyclopora* Norman, 1894; ?*Cheilonella* Koschinsky, 1885; ?*Teuchopora* Neviani, 1895.

Family CREPIDACANTHIDAE Levinsen, 1909

Crepidacantha Levinsen, 1909; *Mastigophora* Hincks, 1880; (*Pachykraspedon* Koschinsky, 1888); *Schizobathysella* Canu and Bassler, 1917; *Nimbella* Jullien, 1903; *Nimba* Jullien, 1903.

Family CELLEPORIDAE Busk, 1852

Hippoporidra, new genus; *Hippotrema*, new genus; *Tegminula* Jullien, 1882; *Holoporella* Waters, 1909; *Costazzia* Neviani, 1895 (*Siniopelta* Levinsen, 1909); *Cellepora* Linnaeus, 1767; *Osthimosia* Jullien, 1888; *Schismopora* MacGillivray, 1888; *Acanthionella* Canu and Bassler, 1917; *Kleidionella* Canu and Bassler, 1917; *Aulopocella* Maplestone, 1903; (*Solenopora* Maplestone, 1903 preoccupied); *Omalosecosa* Canu and Bassler, 1925; *Dentiporella* Barrosa, 1926.

Family LIRIOZOIDAE Levinsen, 1909

Liriozoa (Levinsen, 1909) Lamarck, 1816 (*Epicaulidium* Hincks, 1881); *Pasythea* Lamouroux, 1816 (*Tuliparia* Blainville, 1834; *Gemellipora* Smitt, 1872 part, and Levinsen, 1909 part); *Dittosaria* Busk, 1866.

Family CATENICELLIDAE Busk, 1852

Strongylopora Maplestone, 1899 (*Hincksiella* Levinsen, 1909); *Strophipora* MacGillivray, 1895 (subgenera *Stenostomaria* MacGillivray, 1895; *Microstomaria* MacGillivray, 1895; *Ditaxipora* MacGillivray, 1895); *Claviporella* MacGillivray, 1868; *Calpidium* Busk, 1852; *Digenopora* Maplestone, 1899; *Cribricellina*, new name (*Cribricella* Levinsen, 1909, preoccupied); *Pterocella* Levinsen, 1909; *Costaticella* Maplestone, 1899 (*Costicella* Levinsen, 1909); *Cornuticella*, new genus; *Scuticella* Levinsen, 1909; *Vittaticella* Maplestone, 1900 (*Caloporella* MacGillivray, 1895; *Catenaria* Levinsen, 1909); *Catenicella* Blainville, 1834; *Catenicellopsis* Wilson, 1880.

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Family CATENARIIDAE D'Orbigny, 1851

Catenaria D'Orbigny, 1851 (*Savignyella* Levinsen, 1909); *Halysis* Norman, 1909; *Huxleya* Dyster, 1858.

Family SCLERODOMIDAE Levinsen, 1909

Sclerodomus Levinsen, 1909; *Systenopora* Waters, 1904; *Cellarinella* Waters, 1904; ? *Semihaswellia* Canu and Bassler, 1917; ? *Tessaradoma* Norman, 1868.

Family ONCHOPORIDAE Levinsen, 1909

Onchopora Busk, 1855; *Calwellia* W. Thompson, 1858; *Onchoporella* Busk, 1884; *Onchoporoides* Ortmann, 1890; *Ichthyaria* Busk, 1884.

Family EUTHYRIDAE Levinsen, 1909

Euthyris Hincks, 1882; *Pleurotoichus* Levinsen, 1909; *Urceolipora* MacGillivray, 1880 (*Calymmophora* Busk, 1884); *Neoeuthyris* Bretnall, 1921.

The following families are placed at the end of this division because they are either of doubtful value or are incompletely studied.

Bifaxariidae Busk, 1884 with *Bifaxaria* Busk, 1884; Bitectiporidae MacGillivray, 1895, with *Bitectipora* MacGillivray, 1895; Lekythoglenidae Marsson, 1887, *Lekythoglena* Marsson, 1887; Nephroporidae Marsson, 1887, *Nephropora* Marsson, 1887; Platyglenidae Marsson, 1887, *Platyglena* Marsson, 1887; and Prostomariidae MacGillivray, 1895 with *Prostomaria* MacGillivray, 1895.

Suborder HEXAPOGONA, new suborder

Family CHAPERIIDAE Jullien, 1888

Chaperia Jullien, 1881.

Family MAMILLOPORIDAE, new family

Mamillopora Smitt, 1873; *Fedora* Jullien, 1882; *Anoteropora*, new genus; *Kionidella* Koschinsky, 1885; *Discoflustrellaria* D'Orbigny, 1853; *Prattia* D'Archiac, 1847; *Stenosipora*, new genus; *Ascosia* Jullien, 1882.

Family ORBITULIPORIDAE Canu and Bassler, 1923

Orbitulipora Stoliczka, 1861; *Batopora* Reuss, 1867; *Stichoporina* Stoliczka, 1861; *Sphaerophora* Haswell, 1881; *Schizorthosecos* Canu and Bassler, 1917; ? *Bicupularia* Reuss, 1864.

Family CONESCHARELLINIDAE Levinsen, 1909

Conescharellina D'Orbigny, 1852; *Bipora* Whitelegge, 1887; *Flabellopora* D'Orbigny, 1852; *Trochosodon*, new genus; *Zeuglopora* Maplestone, 1909.

Family MYRIOZOIDAE Smitt, 1866 (part)

Myriozoum Donati, 1750; *Myriozoella* Levinsen, 1909.

Family LEKYTHOPORIDAE Levinsen, 1909

Actisecos, new genus; *Lekythopora* MacGillivray, 1882; *Orthoporidra*, new name (*Orthopora* Waters, 1904, preoccupied); *Turritigera* Busk, 1884; *Poecilopora* MacGillivray, 1886; *Catadysis*, new genus.

ALPHABETIC LIST OF GENERA OF CHILOSTOMATOUS BRYOZOA

Acamarchis Lamouroux, 1816. Synonym of *Bugula*.
Acanthionella Canu and Bassler, 1917. Family Celleporidae.
Acanthocella Canu and Bassler, 1917. Family Alderinidae.
Acanthodesia Canu and Bassler, 1920. Family Biflustridae.
Acerviclausa Gabb and Horn, 1860. Genotype, *A. vermicularis* Gabb and Horn, 1860. Journ. Acad. Nat. Sci., Phila., vol. 4, p. 403. Figure not recognizable.
Acropora Reuss, 1869. Family Acroporidae.
Actisecos new genus. Family Lekythoporidae.
Adenifera Canu and Bassler, 1917. Family Biflustridae.
Adeona (Lamouroux, 1816) Levinsen, 1909. Family Adeonidae.
Adeonella (Busk, 1884) Waters, 1888. Family Adeonidae.
Adeonellopsis MacGillivray, 1886. Family Adeonidae.
Aechmella Canu and Bassler, 1917. Family Opesiulidae.
Aeolopora Lang, 1916. Family Andrioporidae. Cretaceous cribrimorph.
Aetea Lamouroux, 1812. Family Aeteidae.
Aeteopsis Boeck, 1862. Synonym of *Aetea*.
Aimulosia Jullien, 1888. Family Escharellidae.
Alderina Norman, 1903. Family Alderinidae.
Allantopora Lang, 1914. Family Alderinidae.
Alysidium Busk, 1852. Family Alysidiidae.
Alysidota Busk, 1856. Family Phylactellidae.
Amastigia Busk, 1852. Family Scrupocellariidae.
Ammatophora Norman, 1903. Family Alderinidae.
Amphiblestrum Gray, 1848. Family Alderinidae.
Anaptopora Lang, 1916. Family Otoporidae. Cretaceous cribrimorph.
Anarthropora Smitt, 1867. Family Adeonidae.
Anderssonia Kluge, 1914. Synonym of *Amastigia*.
Andreella Jullien, 1888. Family Microporidae.
Andriopora Lang, 1916. Family Andrioporidae. Cretaceous cribrimorph.
Angelopora Lang, 1916. Family Andrioporidae. Cretaceous cribrimorph.
Anguinaria Lamarck, 1816. Synonym of *Aetea*.
Angularia Busk, 1881. No species indicated. Dropped by author.
Annulipora Gray, 1848. Genotype, *Eschara pilosa* Pallas, 1766. Synonym of *Electra*.

Anornithopora Lang, 1916. Family Pelmatoporidae. Cretaceous cribrimorph.
Anoteropora, new genus. Family Mamilloporidae.
Anotopora Lang, 1916. Family Otoporidae. Cretaceous cribrimorph.
Antropora Norman, 1903. Family Hincksinidae.
Antropora Lang, 1916 (preoccupied). See *Coelopora*.
Aplousina, new genus. Family Hincksinidae.
Arachnopusia Jullien, 1886. Family Arachnopusiidae.
Arborella Osburn, 1914. Synonym of *Tetraplaria*.
Argopora Lang, 1916. Family Andrioporidae. Cretaceous cribrimorph.
Arthropoma Levinsen, 1909. Family Escharellidae.
Ascosia Jullien, 1882. Family Mamilloporidae.
Aspidelectra Levinsen, 1909. Family Electrinidae.
Aspidostoma Hincks, 1881. Family Aspidostomidae.
Atelestozoum Harmer, 1926. Family Cellariidae.
Auchenopora Lang, 1916. Family Andrioporidae. Cretaceous cribrimorph.
Aulopocella Maplestone 1903. Family Celleporidae.
Avicella Van Beneden, 1848. Synonym of *Bugula*.
Avicularia Gray, 1848. Synonym of *Bugula*.
Bactrellaria Marsson, 1887. Pal. Abh., vol. 4, p. 59. Type and only species, *B. rugica* Marsson, 1887. Idem, p. 59, pl. 5, fig. 18. Cretaceous. Figure incomplete.
Bactridium Reuss, 1848. Not recognized. *Scrupocellaria* (part) and *Hippozeugosella* (part).
Balantiostoma Marsson, 1887. Perhaps a member of the Escharellidae. Cretaceous.
Baptopora Lang, 1916. Family Pelmatoporidae. Cretaceous cribrimorph.
Barroisina Jullien, 1886. (Probably a synonym of *Pliophloea*.) Family Costulae.
Bathosella Canu and Bassler, 1917. Family Escharellidae.
Bathypora MacGillivray, 1895. Included in *Amphiblestrum*.
Bathystoma Marsson, 1887. Cretaceous. Perhaps Parmulariidae.
Batopora Reuss, 1867. Family Orbituliporidae.
Batrachopora Lang, 1916. Family Pelmatoporidae. Cretaceous cribrimorph.
Beania Johnston, 1840. Family Beaniidae.
Beisselina Canu, 1913. Family Acroporidae.
Bicellaria Blainville, 1830. See *Bicellariella*.
Bicellariella Levinsen, 1909 (*Bicellaria* Blainville, 1830, preoccupied). Family Bicellariellidae.
Bicellarina Levinsen, 1909. Family Bicellariellidae.
Bicupularia Reuss, 1864. Fossil. Perhaps Orbituliporidae. Further studies are necessary.
Bifaxaria Busk, 1884. Family Bifaxariidae Busk, 1884.
Biflustra D'Orbigny, 1852 Bry. Cret., p. 241. *Biflustra* is simply a bifoliate free form of Anasca and has no standing as a genus.
Bifrons MacGillivray, 1860. Synonym of *Dimetopia*.
Bigemellaria MacGillivray, 1895. Synonym of *Tetraplaria*.
Bimicroporella Canu, 1904. Synonym of *Microporella*.
Bipora Whitelegge, 1887. Family Conescharellinidae.
Biselenaria Gregory, 1893. Proposed in place of *Diplotaxis* Reuss, 1867, preoccupied. Genotype, *Diplotaxis placentula* Reuss. Applies to the bilamellar group of *Vibracellina* Canu and Bassler, 1917. Family Hincksinidae.
Bitectipora MacGillivray, 1895. Genotype, *B. lineata* MacGillivray, 1895. A fossil genus incompletely studied. Family Bitectiporidae MacGillivray, 1895.

Bracebridgia MacGillivray, 1886. Family Adeoniidae.
Brettia Dyster, 1858. Family Scrupariidae.
Bryocryptella Cossman, 1906. Family Smittinidae.
Buffonella Jullien, 1888. Family Escharellidae.
Buffonellaria, new genus. Family Escharellidae.
Bugula Oken, 1815. Family Bugulidae.
Bugularia Levinsen, 1909. Family Bugulidae.
Bugulella Verrill, 1879. Allied to *Brettia* (see Harmer, 1923).
Bugulina Gray, 1848. Synonym of *Bugula*.
Bugulopsis Verrill, 1880. Synonym of *Tricellaria*.
Bulbipora MacGillivray, 1895. Fossil. Can not be recognized without further study. Perhaps Reteporidae with *Caberoides* Canu, 1918.
Caberea Lamouroux, 1816. Family Scrupocellariidae.
Caberiella Levinsen, 1909. Synonym of *Amastigia*.
Caberoides Canu 1910. Genotype, *C. canaliculata* Canu, 1910. Fossil. Perhaps Reteporidae.
Caleschara MacGillivray, 1880. Family Opesiulidae.
Callopora Gray, 1848. Family Alderinidae.
Calloporina Neviani, 1895. Family Escharellidae.
Caloporella MacGillivray, 1895. Synonym of *Vittaticella*.
Calpensia Jullien, 1888. Family Calpensiidae.
Calpidium Busk, 1852. Family Catenicellidae.
Calpidopora Lang, 1916. Family Calpidoporidae. Cretaceous cribrimorph.
Calvetina Canu, 1910. Family Adeonidae.
Calwellia W. Thompson, 1858. Family Onchoporidae.
Calymmophora Busk, 1884. Synonym of *Urceolipora*.
Calyptozoum Harmer, 1926. Family Bicellariellidae.
Camptoplites Harmer, 1923. Family Bugulidae.
Canda Lamouroux, 1816. Family Scrupocellariidae.
Carbasea (subgenus of *Flustra*) Gray, 1848. Family Flustridae.
Carydiopora Lang, 1916. Family Pelmatoporidae. Cretaceous cribrimorph.
Castanopora Lang, 1916. Family Pelmatoporidae. Cretaceous cribrimorph.
Catadysis new genus. Family Lekythoporidae.
Catenaires Savigny, 1811. A qualitative and not a generic form.
Catenaria D'Orbigny, 1850 (*Savignyella* Levinsen, 1909). Family Catenariidae.
Catenaria Levinsen, 1909. Synonym of *Vittaticella*.
Catenariopsis Maplestone, 1899. Family Alysidiidae.
Catenicella Blainville, 1834. Family Catenicellidae. A confused genus, dismembered by modern authors. Now a general term for Catenicellidae, unclassified or insufficiently studied.
Catenicellopsis J. B. Wilson, 1880. Family Catenicellidae.
Catenicula O'Donoghue, 1924. Family Alysidiidae.
Caulibugula Verrill, 1900. Family Bugulidae.
Cauloramphus Norman, 1903. Family Alderinidae.
Cellaria (Ellis and Solander, 1786) Authors. Family Cellariidae.
Cellarina D'Orbigny, 1851. See *Cellarinidra*.
Cellarina Van Beneden, 1848 (Not D'Orbigny, 1851). *Menipea* in part.
Cellarinella Waters, 1904. Family Sclerodomidae.
Cellarinidra new name (*Cellarina* D'Orbigny, 1851, preoccupied). Family Biflustridae.
Cellepora Linnaeus, 1767. Family Celleporidae. General term for bryozoa made up of cumulate zooecia.
Cellepororia Lamouroux, 1821. No standing. Refers to almost any incrusting form.

Celleporella Gray, 1848. Genotype, *Cellepora hyalina* Linnaeus, 1768. Not recognizable. Genotype is type of *Hippothoa.*

Celleporella Norman, 1868. Preoccupied. Dropped by author in 1903.

Celleporina Gray, 1848. Not defined so as to be recognized.

Celleporina D'Orbigny, 1852. Bry. Cret., p. 212. Preoccupied and also not recognizable.

Cellularia Pallas 1766. Not recognized. See Harmer, 1923.

Cercaripora Fisher, 1866. Synonym of *Aetea.*

Chaperia Jullien, 1881. Family Chaperiidae.

Characodoma Maplestone, 1900. Family Escharellidae.

Charixa Lang, 1915. Family Electrinidae.

Chartella Gray, 1848 (subgenus of *Flustra*). Family Flustridae.

Chaunosia Busk, 1867. Synonym of *Beania.*

Cheilonella Koschinsky, 1885. Fossil possibly close to *Psilopsella*, new genus. Perhaps Phylactellidae.

Cheilopora Levinsen, 1909. Family Hippopodinidae.

Cheiloporina Canu and Bassler, 1923. Family Hippopodinidae.

Chlidonia (Savigny, 1811) Lamouroux, 1824. Family Chlidoniidae.

Chorizopora Hincks, 1880. Family Hippothoidae.

Chrossotoechia Canu, 1925. Synonym of *Monoporella.*

Cianotremella Canu, 1911. Family Hippopodinidae.

Cigclisula, new genus. Family Stomachetosellidae.

Claviporella MacGillivray, 1895. Family Catenicellidae.

Coeleschara Busk, 1860. Nomen nudum.

Coelopora Lang, 1917. Family Pelmatoporidae. Cretaceous cribrimorph.

Coleopora, new genus. Family Petraliidae.

Collarina Jullien, 1888. Family Costulae.

Colletosia Jullien, 1886. Family Costulae. Genus requiring further study.

Columnaria Levinsen, 1909. See *Levinsenella* Harmer, 1926.

Columnotheca Marsson, 1887. Type and only species, *C. cribrosa* Marsson, 1887. Family Acroporidae. Cretaceous.

Conescharellina D'Orbigny, 1852. Family Conescharellinidae.

Conopeum Norman, 1903. Family Biflustridae.

Copidozoum Harmer, 1926. Synonym of *Callopora.*

Corbulipora MacGillivray, 1895. Family Costulae.

Cornucopina Levinsen, 1909. Family Bicellariellidae.

Cornuticella, new genus. Family Catenicellidae.

Corymbopora Lang, 1916 (preoccupied). See *Corymboporella.*

Corymboporella Lang, 1917. Family Andrioporidae. Cretaceous cribrimorph

Corynoporella Hincks, 1888. Family Scrupariidae.

Corynostylus Canu and Bassler, 1919. Family Calpensiidae.

Cosciniopsis, new genus. Family Galeopsidae.

Coscinopleura Marsson, 1887. Family Coscinopleuridae.

Costaticella Maplestone, 1899. Family Catenicellidae.

Costazzia Neviani, 1895 (*Siniopelta* Levinsen, 1909). Family Celleporidae.

Costicella Levinsen, 1909. Synonym of *Costaticella.*

Costula Jullien, 1886. Family Costulae. Genotype, *Escharella arge* D'Orbigny, 1851. Cretaceous. Genotype of doubtful position.

Cothurnicella Wyville Thompson, 1858. Synonym of *Chlidonia.*

Craspedozoum MacGillivray, 1895. *F. roborata* group of *Flabellaris.*

Crassimarginatella Canu, 1909. Family Alderinidae.

Crateropora Levinsen, 1909. Family Setosellidae.

Crepidacantha Levinsen, 1909. Family Crepidacanthidae.

Crepis Jullien, 1882. Family Chlidoniidae.
Cribella Jullien and Calvet, 1903. Genotype, *C. nova* Jullien and Calvet, 1903. Genotype incomplete. Impossible to classify.
Cribrendoecium Canu and Bassler, 1917. Family Hincksinidae.
Cribricella Canu, 1902. Synonym of *Adeonellopsis*.
Cribricella Levinsen, 1909. See *Cribricellina*.
Cribricellina, new name (*Cribricella* Levinsen, 1909). Family Catenicellidae.
Cribrilina Gray, 1848. Family Alderinidae. The word is also used by different authors to designate costulate species imperfectly studied and by students who do not admit the recent classification.
Crisina Van Beneden, 1850. Synonym of *Scrupocellaria*.
Crisularia Gray, 1848. Synonym of *Bugula*.
Cryptella Jullien, 1903 (preoccupied). See *Bryocryptella*.
Cryptostoma Marsson, 1887. Pal. Abh., vol. 4, p. 96. Type and only species. *C. gastroporum* Marsson, 1887. Cretaceous. Incompletely studied.
Cryptostomaria, new genus. Family Cellariidae.
Cryptosula Canu and Bassler, 1925. Family Escharellidae.
Ctenopora Lang, 1916. Family Ctenoporidae. Cretaceous cribrimorph.
Cucullipora MacGillivray, 1895. Possibly related to *Watersipora*.
Cupuladria Canu and Bassler, 1919. Family Biflustridae.
Cupularia Lamouroux, 1821. Family Calpensiidae.
Cycleschara Roemer, 1863. Genotype, *C. marginata* Roemer, 1863. Paleontographica, vol. 9, p. 204. Fossil never rediscovered.
Cyclicopora Hincks, 1884. Family Cyclicoporidae.
Cyclocolposa Canu and Bassler, 1920. Family Escharellidae.
Cycloperiella Canu and Bassler, 1920. Family Escharellidae.
Cycloporella Neviani, 1895. Synonym of *Costazzia*.
Cyclostomella Ortmann, 1890. Family Adeonidae.
Cylindroporella Hincks, 1877. Family Galeopsidae.
Cyphonella Koschinsky, 1885. Only species, *C. nodosa* Koschinsky, 1885. Palaeontographica, vol. 32, 1885, p. 59. Tertiary of Bavaria. Incomplete. Impossible to classify at present.
Cystisella Canu and Bassler, 1917. Family Smittinidae.
Dacryonella Canu and Bassler, 1917. Family Opesiulidae.
Dacryopora Lang, 1914. Family Hippothoidae.
Dakaria Jullien, 1903. Family Escharellidae.
Decurtaria Jullien, 1886. Family Costulae. Cretaceous. Referred by Lang to Pelmatoporidae.
Dendrobeania Levinsen, 1909. Family Bugulidae.
Dentiporella Barrosa, 1926. Family Celleporidae.
Dermatopora Hagenow, 1851. (*Batrachopora* Lang, 1916); Cretaceous. Incompletely studied.
Diacanthopora Lang, 1916. Family Pelmatoporidae. Cretaceous cribrimorph.
Diachoris (subgenus of *Beania*) Busk, 1852. Family Beaniidae.
Diancopora Lang, 1916. Family Rhacheoporidae. Cretaceous cribrimorph.
Diatosula new genus. Family Stomachetosellidae.
Diazeuxia Jullien, 1886. Synonym of *Hippothoa*.
Diceratopora Lang, 1916. Family Rhacheoporidae. Cretaceous cribrimorph.
Dictuonia Jullien, 1881. Family Membranicellariidae.
Dictyopora MacGillivray, 1868. Synonym of *Adeona*.
Didymia Busk, 1852 (preoccupied). See *Didymozoum*.
Didymosella Canu and Bassler, 1917. Family Escharellidae.
Didymozoum Harmer, 1923 (*Didymia* Busk, 1852, preoccupied). Family Farciminariidae.

Digenopora Maplestone, 1899. Family Catenicellidae.
Dimetopia Busk, 1852. Family Bicellariellidae.
Dimiclausa Gregorio, 1890. Synonym of *Lunularia.*
Dimorphocella Maplestone, 1903. Family Adeonidae.
Dimorphozoum Levinsen, 1909. Family Bicellariellidae.
Dioptropora Marsson, 1887. Pal. Abh., vol. 4, p. 96. Type and only species *D. devia* Marsson, 1887. Cretaceous. Genus problematic.
Diplodidymia Reuss, 1869. Family Calpensiidae.
Diploecium Kirkpatrick, 1888. Family Hippopodinidae.
Diplopholeos Canu and Bassler, 1917. Synonym of *Velumella.*
Diplopora MacGillivray, 1881. Synonym of *Thairopora.*
Diploporella MacGillivray, 1885. Synonym of *Thairopora.*
Diplotaxis Reuss, 1867. Preoccupied. See *Biselenaria.*
Diporula Hincks, 1879. Subgenus of *Microporella.* Family Escharellidae.
Discoescharites Roemer, 1863. Synonym of *Stichoporina.*
Discoflustrella D'Orbigny, 1853. Bry. Cret., p. 561. The two species described by D'Orbigny (*D. doma* and *D. complanata*) are now referred to *Cupularia.*
Discoflustrellaria D'Orbigny, 1851. Family Mamilloporidae.
Discopora Lamarck, 1836. Genotype, *Cellepora verrucosa* Esper, 1797. Not recognized.
Discoporella D'Orbigny, 1851. Synonym of *Cupularia.*
Dishelopora Lang. Family Disheloporidae. Cretaceous cribrimorph.
Distansescharella D'Orbigny, 1852. Family Costulae. Doubtful genus according to Waters, 1923. Referred by Lang to Andrioporidae.
Distansescharellina D'Orbigny, 1852. Bry. Cret., p. 451. Type and only species *Cellepora pteropora* Reuss, 1848. Miocene of Vienna Basin. D'Orbigny badly interpreted the poor figure of Reuss. Synonym of *Peristomella.*
Disteginopora D'Orbigny, 1852. Bry. Cret., p. 235. Genotype, *D. horrida* D'Orbigny, 1852. Cretaceous Costulae. Referred by Lang to Pelmatoporidae.
Distelopora Lang, 1915. Family Electrinidae. Genus of uncertain affinities.
Ditaxipora MacGillivray, 1895. Subgenus of *Strophipora.* Family Catenicellidae.
Dittosaria Busk, 1866. Family Liriozoidae.
Doryporella Norman. Subgenus of *Callopora.*
Electra Lamouroux, 1916. Family Electrinidae.
Electrina D'Orbigny 1851. Synonym of *Electra.*
Ellipsia Jullien 1903. Synonym of *Retepora.*
Ellipsopora Canu and Bassler, 1923 (subgenus of *Microporella*). Family Escharellidae.
Ellisina Norman, 1903. Family Alderinidae.
Emballotheca Levinsen, 1909. Family Escharellidae.
Emma Gray, 1843. Synonym of *Menipea.*
Ennallipora Gabb and Horn, 1862. Genotype, *E. quadrangularis* Gabb and Horn, 1862. Jour. Acad. Nat. Sci. Phila., sec. 2, vol. 5, p. 141. Hardly recognizable although possibly a species of *Smittina.*
Enoplostomella Canu and Bassler, 1917. Family Stomachetosellidae.
Entomaria Canu, 1921. Family Setosellidae.
Epicaulidium Hincks, 1881. Synonym of *Liriozoa.*
Epistomia Fleming, 1828. Family Epistomiidae.
Erina Canu, 1908. See *Erinella.*
Erinella, new name (*Erina* Canu, 1908, preoccupied). Family Membranicellariidae.

Eschara (Raii, 1724) Linnaeus, 1785. Apparently based on same structural type as Flustra but used for any free form of Ascophora with two lamellae back to back.

Escharella Gray, 1848. Genotype, *Berenicea immersa* Fleming, 1828. Not recognizable.

Escharellina D'Orbigny, 1852. Bry. Cret., p. 206. Not recognized.

Escharicellaria Voigt, 1924. Family Cellariidae.

Escharifora D'Orbigny, 1852. Family Coscinopleuridae.

Escharina M. Edwards, 1836 in Lamarck, Hist., ed. 2, p. 231. Type, *Eschara vulgaris* Moll, 1803. Not recognized.

Escharinella D'Orbigny, 1852. Bry. Cret., p. 200. Not recognized.

Escharipora D'Orbigny, 1852. Bry. Cret., p. 220. Cretaceous cribrimorph. See Lang, 1921.

Escharoides Milne-Edwards in Lamarck, 1836. Family Stomachetosellidae. Reserved for species incompletely studied.

Escharopsis Verrill, 1879. Genotype, *Eschara lobata* Lamarck, 1836. Not recognized.

Eucheilopora Lang, 1916. Family Andrioporidae. Cretaceous cribrimorph.

Eucratea Lamouroux, 1812. Family Scrupariidae.

Euginoma Jullien, 1882. Family Cellariidae.

Euoplozoum Harmer, 1923. Family Bugulidae.

Euritina Canu, 1900. Family Alderinidae.

Eurystomella Levinsen, 1909. Family Eurystomellidae.

Euthyris Hincks, 1882. Family Euthyridae.

Euthyroides Harmer, 1902. Family Euthyroidae.

Exechonella, new genus. Family Arachnopusiidae.

Exochella Jullien, 1888. Family Escharellidae.

Farcimia Fleming, 1828. Synonym of *Cellaria*.

Farcimia Pourtales, 1870. Bull. Mus. Comp. Zool. Harv. Coll., p. 110. Genotype, *F. cereus* Pourtales, 1870. Idem, p. 110. Not recognized. Probably a synonym of *Nellia*.

Farciminaria Busk, 1852. Family Farciminariidae.

Farciminellum Harmer, 1926. Family Farciminariidae.

Fedora Jullien, 1882. Family Mamilloporidae.

Fenestrulina Jullien, 1888. Family Escharellidae.

Figularia Jullien, 1886 (*Figulina* Levinsen, 1909). Family Costulae.

Figulina Levinsen, 1909. See *Figularia*.

Filicella Searles Wood, 1844. Synonym of *Actea*.

Filiflustra D'Orbigny, 1852. Bry. Cret., p. 140. First species *Filiflustra compressa* D'Orbigny, 1852. Idem, p. 241, pl. 687, figs. 7–9. Cretaceous.

Filiflustrella D'Orbigny, 1853. Bry. Cret., p. 562. Type species *F. lateralis* D'Orbigny 1853. Idem, p. 562, pl. 730, figs. 1–4. Cretaceous.

Filiflustrellaria D'Orbigny, 1853. Bry. Cret., p. 512. First species figured *F. obliqua* D'Orbigny 1853. Idem, p. 513, pl. 123, figs. 1–4. Cretaceous.

Filiflustrina D'Orbigny, 1853. Bry. Cret., p. 575. Type species *F. cylindrica* D'Orbigny, 1853. Idem, p. 575, pl. 732, figs. 1–5. Cretaceous.

Flabellaria Gray, 1848. Cat. Rad. Brit. Mus., pp. 106, 146. Type, *Sertularia spiralis* Olivi, 1792, Zool. Adriat., p. 291, pl. 6, fig. 2. Genotype never rediscovered with certainty.

Flabellaris Waters, 1898. Family Scrupocellariidae.

Flabellina Levinsen, 1902. Preoccupied. See *Flabellaris*.

Flabellopora D'Orbigny, 1851. Family Conescharellinidae.

Floridina Jullien, 1881. Family Opesiulidae.

Floridinella Canu and Bassler, 1917. Family Opesiulidae.

Flustra Linnaeus, 1761. Family Flustridae.

Flustramorpha Gray, 1848. (Subgenus of *Microporella*). Family Escharellidae.

Flustrella D'Orbigny, 1852. Bry. Cret., p. 282. Genus not recognized. *Flustrella* employed in Ctenostomata (Gray, 1848).

Flustrellaria D'Orbigny, Bry. Cret., p. 513. Cretaceous. Applies to various genera of Membraniporae.

Flustrina Van Beneden, 1849. Synonym of *Carbasea*.

Flustrina D'Orbigny, 1852. Bry. Cret., p. 298. First species *F. transversa* D'Orbigny, 1852. Too poor for determination. Cretaceous.

Foraminella Levinsen, 1909. Family Aspidostomidae.

Foratella Canu, 1900. Bull. Soc. Geol. France, ser. 3, vol. 28, p. 373. Genotype, *Flustrellaria forata* D'Orbigny, 1850. Bry. Cret., p. 528, pl. 726, figs. 10–13. Cretaceous.

Foveolaria Busk, 1884. Family Alderinidae.

Francopora Lang, 1916. Family Pelmatoporidae. Cretaceous cribrimorph.

Frurionella Canu and Bassler, 1927. Family Alderinidae.

Fusicellaria D'Orbigny, 1851. Bry. Cret., p. 185. Type species *F. pulchella* D'Orbigny, 1851. Idem, p. 186, pl. 680, figs. 1–6. Turonian of France, Cretaceous.

Galeopsis Jullien, 1903. Family Galeopsidae.

Gargantua Jullien, 1888. Family Opesiulidae.

Gastropella Canu and Bassler, 1917. Family Acroporidae.

Gaudryanella Canu, 1900. Family Steganoporellidae.

Geisopora Lang, 1916. Family Rhacheoporidae. Cretaceous cribrimorph.

Gemellaria (Savigny, 1826) Van Beneden, 1845. Synonym of *Eucratea*.

Gemellipora Smitt, 1872. Family Escharellidae.

Gemellipora Smitt, 1872 (part). Synonym of *Pasythea*.

Gemelliporella Canu and Bassler, 1920. Family Escharellidae.

Gemelliporidra, new genus. Family Escharellidae.

Gemicellaria Blainville, 1820. Synonym of *Gemellaria*.

Gephyrophora Busk, 1884. Family Galeopsidae.

Gephyrotes Norman, 1903. Family Alderinidae.

Gigantopora Ridley, 1881. Family Galeopsidae.

Grammella Canu, 1917. Synonym of *Crassimarginatella*.

Graptopora Lang, 1916. Family Calpidoporidae. Cretaceous cribrimorph.

Hagenowinella Canu, 1900. Bull. Soc. Geol. France, ser. 3, vol. 28, p. 377. Genotype, *Cellepora vaginata* Hagenow, 1851. Cretaceous.

Halophila (Gray, 1843) Busk, 1852. Family Bugulidae.

Halysis Norman, 1909. Family Catenariidae.

Haplocephalopora Lang, 1916. Family Pelmatoporidae. Cretaceous cribrimorph.

Haplopoma Levinsen, 1909. Family Hippothoidae.

Haploporella Hincks, 1881. Preoccupied. See *Monoporella*.

Harmeria Norman, 1903. Family Hippothoidae.

Haswellia Busk, 1884. Family Galeopsidae.

Heckelia Neviani, 1895. Synonym of *Adeona*.

Heliodoma Calvet, 1907. Family Biflustridae.

Hemeschara Busk, 1859. Not recognized. Used for unilamellar Ascophora by Busk.

Hemicyclopora Norman, 1894. Family Phylactellidae.

Hemieschara Reuss, 1869. An alteration of *Hemeschara* Busk, 1859.

Hemiseptella Levinsen, 1909. Family Calpensiidae.

Herentia Gray, 1848. Not recognized. Species of various genera included.

Herpetopora Lang, 1914. Family Electrinidae.
Hesperopora Lang, 1916. Family Pelmatoporidae. Cretaceous cribrimorph.
Heteractis Gabb and Horn, 1862. Synonym of *Trochopora*.
Heterocella Canu, 1907. Family Synaptacellidae.
Heteroflustra Levinsen, 1909. Family Flustridae.
Heterooecium Hincks, 1892. Family Electrinidae.
Hexacanthopora Lang, 1916. Family Lagynoporidae. Cretaceous cribrimorph.
Hiantopora MacGillivray, 1887. Family Hiantoporidae.
Himantozoum Harmer, 1923. Family Bugulidae.
Hincksina Norman, 1909. Family Hincksinidae.
Hincksiella Levinsen, 1909. Synonym of *Strongylopora*.
Hipodiplosella Barroso, 1920. Not defined.
Hippadenella Canu and Bassler, 1917. Family Escharellidae.
Hippaliosina Canu, 1918. Family Hippopodinidae.
Hippellozoon Canu and Bassler, 1917. Family Reteporidae.
Hippiopora Lang, 1916. Family Andrioporidae. Cretaceous cribrimorph.
Hippodiplosia Canu, 1916. Family Escharellidae.
Hippomenella Canu and Bassler, 1917. Family Escharellidae.
Hippopleurifera, new genus. Family Escharellidae.
Hippopodina Levinsen, 1909. Family Hippopodinidae.
Hippopodinella Barroso, 1924. Family Hippopodinidae.
Hippoponella Canu and Bassler, 1920. Family Escharellidae.
Hippoporella Canu and Bassler, 1920. Family Escharellidae.
Hippoporidra, new genus. Family Celleporidae.
Hippoporina Neviani, 1895. Family Escharellidae.
Hippothoa (Lamouroux, 1821) Hincks, 1880. Family Hippothoidae.
Hippothoida Vine, 1893. Misprint for *Hippothoa*.
Hippotrema, new genus. Family Celleporidae.
Hippozeugosella Canu and Bassler, 1917. Family Escharellidae.
Holoporella Waters, 1909. Family Celleporidae.
Holostegopora Lang, 1916. Family Andrioporidae. Cretaceous cribrimorph.
Holostoma MacGillivray, 1888. A group of Celleporidae.
Homalostega Marsson, 1887. Genotype, *Cellepora convexa* Hagenow, 1839. Cretaceous. Incompletely studied but related to *Aechmella*. Family Opesiulidae.
Hoplitella Levinsen, 1909. Family Scrupocellariidae.
Hoplocheilina Canu, 1911. Family Hiantoporidae.
Houzeauina Pergens, 1889. Family Escharellidae.
Huxleya Dyster, 1858. Family Catenariidae.
Hybopora Lang, 1916. Family Andrioporidae. Cretaceous cribrimorph.
Hystricopora Lang, 1916. Family Disheloporidae. Cretaceous cribrimorph.
Ichnopora Lang, 1916. Family Petaloporidae. Cretaceous cribrimorph.
Ichthyaria Busk, 1884. Family Onchoporidae.
Inversiula, Jullien, 1888. Family Adeonidae.
Jaculina Jullien and Calvet, 1903. Family Smittinidae.
Jolietina Jullien, 1886. Costulae.
Jubella Jullien, 1882. Family Scrupocellariidae.
Kankapora Lang, 1916. Family Andrioporidae. Cretaceous cribrimorph.
Kelestoma Marsson, 1887. Costulae, Cretaceous. (See Waters, 1923, p. 565.) Referred to Pelmatoporidae, by Lang.
Kenella Levinsen, 1909. Family Flustridae.
Kinetoskias Danielssen, 1868. Family Bugulidae.
Kionidella Koschinsky, 1885. Family Mamilloporidae.

Kleidionella Canu and Bassler, 1917. Family Celleporidae.

Kymella Canu and Bassler, 1917. Family Cyclicoporidae.

Labiopora Levinsen, 1909. See *Labioporella*.

Labioporella Harmer, 1926. Family Steganoporellidae.

Lacerna Jullien, 1888. Family Escharellidae.

Lagarozoum Harmer, 1926, synonym of *Entomaria*.

Lagenipora Hincks, 1877. Family Phylactellidae.

Lagodiopsis Marsson, 1899. Pal. Abh., vol. 4, p. 99, Type, *Multescharipora francqana* D'Orbigny, 1851, Costulae. Synonym of *Murinopsia*.

Lagynopora Lang. 1916. Family Lagynoporidae. Cretaceous cribrimorph.

Laminopora Michelin, 1842. Family Adeonidae.

Lanceopora D'Orbigny, 1851 (probably synonym of *Parmularia*). Family Parmulariidae.

Larnacius Norman, 1903. Family Alderinidae.

Latereschara D'Orbigny, 1852. Bry. Cret., p. 345. Type species, *L. achates* D'Orbigny, 1852. Senonian of Fecamp, France. Cretaceous.

Lateroflustrella D'Orbigny, 1853. Bry. Cret., p. 568. Type species, *L. complanata*, D'Orbigny, 1853. Cretaceous. Not recognized.

Lateroflustrellaria D'Orbigny, 1853. Bry Cret., p. 512. Type *L. hexagona* D'Orbigny, 1853. Cretaceous.

Leieschara M. Sars, 1862, Genotype, *L. coarctata* Sars, 1862. Synonym of *Myriozoum*.

Leiosella Canu and Bassler. 1917. Family Stomachetosellidae.

Lekythoglena Marsson. 1887. Pal. Abh., vol. 4, p. 90. Genotype *L. ampullacea* Marsson, 1887. Idem. p. 90, fig. 7 Cretaceous. Family Lekythoglenidae Marsson, 1887. Referred by Lang to Andrioporidae. Cretaceous cribrimoph.

Lekythopora MacGillivray, 1882. Family Lekythoporidae.

Lepralia Johnston, 1838. Family Escharellidae. Formerly applied to almost any incrusting form but now employed for unplaced species of Hippoporae. See Lang 1917 and 1921.

Lepraliella Levinsen, 1909. Family Reteporidae.

Lepralina Kühn, 1925. Family Costulae.

Leptocheilopora Lang, 1916. Family Lagynoporidae. Cretaceous cribrimorph.

Levinsenella Harmer, 1926. Family Farciminariidae.

Levinseniula Cossman, 1920. Synonym of *Porella*.

Licornia Van Beneden, 1850. Synonym of *Scrupocellaria*.

Liriozoa Lamarck, 1816 (Levinsen, 1909). Family Liriozoidae.

Lobopora Levinsen, 1909 (subgenus of *Adeonellopsis*). Family Adeonidae.

Loricaria Lamouroux, 1821. Synonym of *Eucratea*.

Loricula Cuvier, 1830. Synonym of *Eucratea*.

Lunularia Busk, 1884. Family Opesiulidae.

Lunulites Authors. Family Opesiulidae. A general term of nomenclature for free turbinate conical forms.

Lyrula Jullien, 1888. Family Costulae.

Macropora MacGillivray, 1895. Family Aspidostomidae.

Malakosaria Goldstein, 1881. Genotype, *M. pholaramphos* Goldstein, 1881. (*Onchopora sinclairi* Busk, 1881). Synonym of *Onchopora* (fide Busk, 1884).

Malleatia Jullien and Calvet, 1903. Family Smittinidae.

Mamillopora Smitt, 1872. Family Mamilloporidae.

Manzonella Jullien, 1888. Family Thalamoporellidae.

Maplestonia MacGillivray, 1884. Family Scrupocellariidae.

Marginaria Roemer, 1841. Cretaceous. Family Alderinidae. The nature of the pores figured by authors is not known.

Marguetta Jullien and Calvet, 1903. Family Smittinidae.
Marsillea Neviani, 1895. Synonym of *Porella*.
Marssonopora Lang, 1914. Family Alderinidae.
Mastigophora Hincks, 1880. Family Crepidacanthidae.
Megapora Hincks, 1877. Family Aspidostomidae.
Melicerita Milne-Edwards, 1836. Family Cellariidae.
Melicertina Ehrenberg, 1839. Synonym of *Melicerita*.
Membranicellaria Levinsen, 1902. Family Membranicellariidae.
Membranipora Blainville, 1830. Family Biflustridae. The word *Membranipora* is employed by many authors as a general term to designate the Malacostega or as a general term for unplaced Membraniporae.
Membraniporella Smitt, 1873. Family Alderinidae.
Membraniporidra Canu and Bassler, 1917. Family Alderinidae.
Membraniporina Levinsen, 1909. Family Biflustridae. An artificial genus for Membraniporae incompletely known.
Membrendoecium Canu and Bassler, 1917. Family Hincksinidae.
Membrostega Jullien, 1903. Synonym for *Hiantopora*.
Menipea Lamouroux, 1816. Family Scrupocellariidae.
Meniscopora Gregory, 1903. Family Adeonidae.
Mesosecos Faura Y Sans and Canu, 1916. Diagnosis incorrect. Inner side of colony unknown. Probably same as *Cupuladria*.
Mesostomaria, new genus. Family Cellariidae.
Metracolposa Canu and Bassler, 1917. Family Costulae.
Metradolium Canu and Bassler, 1917. Family Stomachetosellidae.
Metrarabdotos Canu, 1914. Family Hippopodinidae.
Metrocrypta Canu and Bassler, 1917. Family Stomachetosellidae.
Metroperiella Canu and Bassler, 1917 (subgenus of *Schizomavella*). Family Escharellidae.
Micropora Gray, 1848. Family Opesiulidae.
Microporella Hincks, 1877. Family Escharellidae.
Microporina Levinsen, 1909. Family Calpensiidae.
Microstoma Gray, 1848. Preoccupied and also not defined.
Microstomaria MacGillivray, 1895. Subgenus of *Strophipora*. Family Catenicellidae.
Mollia Lamouroux, 1821. Family Aspidostomidae.
Monoceratopora Lang, 1916. Family Andrioporidae. Cretaceous cribrimorph.
Monocerina Neviani, 1900. Fossil. Structure incompletely known.
Monoporella Hincks, 1881. Family Aspidostomidae.
Monsella Canu, 1900. Family Opesiulidae.
Morphasmopora Lang, 1916. Family Pelmatoporidae. Cretaceous cribrimorph.
Mucronella Hincks, 1880. Family Smittinidae.
Multescharinella D'Orbigny, 1952. Bry. Cret., p. 431. Type species, *Cellepora prolifera* Reuss, 1848, which has not been rediscovered for further study.
Multescharipora D'Orbigny, 1853. Bry. Cret., p. 495. Cretaceous cribrimorph. See Lang, 1921, p. lxii.
Mumiella Jullien, 1880. Type, *Semiescharipora mumia* D'Orbigny, 1852. Family Costulae. Cretaceous.
Murinopsia Jullien, 1886. Type, *Multescharipora galeata* Beissel, 1868. Family Costulae. Cretaceous. Referred by Lang to Pelmatoporidae.
Myagropora Lang, 1916. Family Myagroporidae. Cretaceous cribrimorph.
Myriapora Blainville, 1830. Synonym of *Myriozoum*.
Myrioporina Ehrenberg, 1830. Synonym of *Myriozoum*.
Myriozoella Levinsen, 1909. Family Myriozoidae.

Myriozoum Donati, 1750. Family Myriozoidae.

Mystriopora Lang, 1915. Family Electrinidae.

Nannopora Lang, 1916. Family Andrioporidae. Cretaceous cribrimorph.

Naresia Wyville Thompson, 1873. Synonym of *Kinetoskias.*

Nellia Busk, 1852. Family Farciminariidae.

Nematopora Duvergier, 1921 (preoccupied). See *Nematoporella.*

Nematoporella, new name. Family Opesiulidae.

Neoeuthyris Bretnall, 1921. Family Euthyridae.

Nephropora Marsson, 1887. Pal. Abh., vol. 10, p. 90. Type and only known species *N. elegans* Marsson. Family Nephroporidae Marsson, 1887.

Nichtina Canu, 1900. See *Nitscheina.*

Nimba Jullien, 1903. Family Crepidacanthidae.

Nimbella Jullien, 1903. Family Crepidacanthidae.

Nitscheina (*Nichtina* in error) Canu, 1900. Family Electrinidae.

Normanellina Cossman, 1920. Synonym of *Conopeum.*

Notamia Fleming, 1828. Synonym of *Eucratea.*

Notoplites Harmer, 1923. Family Scrupocellariidae.

Ochetosella Canu and Bassler, 1917. Family Stomachetosellidae.

Odontionella Canu and Bassler, 1917. Family Aspidostomidae.

Ogiva Jullien, 1881. Family Opesiulidae. Genotype *Eschara actea* D'Orbigny, 1851. Cretaceous. An inexact Cretaceous genus.

Ogivalia Jullien, 1881. Family Opesiulidae. Cretaceous. Genotypes, *Vincularia elegans* D'Orbigny, 1851 and *Eschara santonensis* D'Orbigny, 1851. An inexact genus.

Ogivalina Canu and Bassler, 1917. Family Hincksinidae.

Oligotopora Lang, 1916. Family Andrioporidae. Cretaceous cribrimorph.

Oligotresium Gabb and Horn, 1862. Synonym of *Lunularia.*

Omalosecosa Canu and Bassler, 1925. Family Celleporidae.

Omoiosia, new genus. Family Membranicellariidae.

Onchopora Busk, 1855. Family Onchoporidae.

Onchoporella Busk, 1884. Family Onchoporidae.

Onchoporoides Ortmann, 1890. Family Onchoporidae.

Onychocella Jullien, 1881. Family Opesiulidae.

Oochilina Norman, 1903. Synonym of *Crassimarginatella.*

Opisthornithopora Lang, 1916. Family Pelmatoporidae. Cretaceous cribrimorph.

Orbitulipora Stoliczka, 1861. Family Orbituliporidae.

Ornatella Canu, 1900. Genotype *Membranipora ornata* D'Orbigny, 1850. Cretaceous. Incompletely studied.

Ornithopora D'Orbigny, 1852. Synonym of *Bugula.*

Ornithoporina D'Orbigny, 1852. Synonym of *Bugula.*

Orthopora Waters, 1904. See *Orthoporidra*, new name.

Orthoporidra, new name. Proposed for *Orthopora* Waters, 1904 (not Hall, 1886). Family Lekythoporidae.

Osthimosia Jullien, 1888. Family Celleporidae.

Otionella Canu and Bassler, 1917. Family Biflustridae.

Otopora Lang, 1916. Family Otoporidae. Cretaceous cribrimorph.

Ovaticella Maplestone, 1900. Type *O. turbinata* Maplestone, 1900. Tertiary of Australia. Type incomplete. Synonym or close to *Adeonellopsis.*

Pachydera Marsson, 1887. Pal. Abh., vol. 4, p. 100. Type and only species, *P. grandis* Marsson. Costulae. Referred by Lang to Pelmatoporidae.

Pachykraspedon Koschinsky, 1885. First species, *P. clarum* Koschinsky, 1885. Palaeontographica, vol 32, 1885, p. 43. ?Synonym for *Mastigophora.*

Pachystomaria MacGillivray, 1895. Family Galeopsidae.

Pachytheca Canu, 1913. Family Acroporidae.
Palmicellaria Alder, 1864. Family Smittinidae.
Pancheilopora Lang, 1916. Family Andrioporidae. Cretaceous cribrimorph.
Parmularia Maplestone, 1910. Family Parmulariidae.
Pasythea Lamouroux, 1812. Family Liriozoidae.
Parolunulites D'Orbigny, 1852. Bry. Cret., p. 358. Only a growth form of *Lunularia*.
Pelmatopora Lang, 1916. Family Pelmatoporidae. Cretaceous cribrimorph.
Peneclausa Jullien, 1888. Synonym of *Micropora*.
Pergensina Jullien, 1888. Synonym of *Thairopora*.
Perigastrella Canu and Bassler, 1917. Family Phylactellidae.
Periporosella Canu and Bassler, 1917. Family Alderinidae.
Peristomella Levinsen, 1902. Family Escharellidae.
Periteichisma Koschinsky, 1885. Palaeontographica, vol. 32, p. 25. First species, *Vincularia geometrica* Reuss, 1869. Second species, *Cellepora deplanata* Reuss, 1847. Fossils incompletely studied.
Petalostegus Levinsen, 1909. Family Bicellariellidae.
Petralia MacGillivray, 1887. Family Petraliidae.
Petraliella new genus. Family Petraliidae.
Phidolopora Gabb and Horn, 1862. Family Reteporidae.
Phoceana Jullien, 1903. Family Smittinidae.
Phonicosia Jullien, 1881. Family Escharellidae.
Phractopora Lang, 1916. Preoccupied. See *Phractoporella*.
Phractoporella Lang, 1917. Family Pelmatoporidae. Cretaceous cribrimorph.
Phrynopora Lang, 1916. Family Pelmatoporidae. Cretaceous cribrimorph.
Phylactella Hincks, 1880. Family Phylactellidae.
Pithodella Marsson, 1887. Pal. Abh., vol. 4, p. 53. Genotype, *P. cincta* Marsson, 1887, Idem, p. 53, pl. 5, fig. 7. Family Alderinidae? Cretaceous.
Plagiopora MacGillivray, 1895. Journal Royal Society Victoria, vol. 4, p. 79. Perhaps Reteporidae with *Bulbipora* and *Caberoides*. Fossil.
Plagiosmittia Canu and Bassler, 1917. Family Smittinidae.
Planicellaria D'Orbigny, 1851. Bry. Cret., p. 36. Type species, *Planicellaria oculata* D'Orbigny, 1851, Idem, p. 37, pl. 653, figs. 1–5. Cretaceous. Can not be classified at present.
Platyglena Marsson, 1887. Pal. Abh., vol. 4, p. 89. Genotype, *P. clava* Marsson, Idem. p. 89, pl. 9, fig. 3. Family Platyglenidae Marsson, 1887. Cretaceous.
Pleuroschiziella Canu, 1918. Costulae. Fossil.
Pleurotoichus Levinsen, 1909. Family Euthyridae.
Plicopora MacGillivray, 1895. Fossil. Type incomplete.
Pliophloea Gabb and Horn, 1862. Genotype, *Flustra sagena* Morton, 1834. Family Costulae. Referred to Andrioporidae by Lang.
Poecilopora MacGillivray, 1886. Family Lekythoporidae.
Poikilla Jullien, 1903. No species cited. According to description might be *Schizellozoon*.
Pollaploecium Maplestone, 1909. Family Hippopodinidae.
Polycephalopora Lang, 1916. Family Pelmatoporidae. Cretaceous cribrimorph.
Polyceratopora Lang, 1916. Family Andrioporidae. Cretaceous cribrimorph.
Polyeschara Reuss, 1867. Not defined. Genotype, *P. confusa* Reuss, 1867. Lower Oligocene of Germany.
Porella Gray, 1848. Family Smittinidae.

Porellina D'Orbigny, 1851. Bry. Cret., p. 476. First species, *Eschara macrocheila* Reuss, 1848. Foss. Poly. des Wiener, pl. 8, fig. 14 (=*Umbonula*) Second species, *Eschara coscinophora* Reuss, Idem, pl. 8, fig. 20 (=*Adeonellopsis*). Not recognized.

Poricella Canu, 1904 (subgenus of *Adeonellopsis*). Family Adeonidae.

Poricellaria D'Orbigny, 1852. Not figured. Synonym of *Diplodidymia*.

Porina D'Orbigny, 1852. Bry. Cret., p. 432. First species *Eschara filograna* Goldfuss, 1826. Genus reserved for incompletely studied fossil species, having a pore below the aperture. Lang erroneously chose *Eschara gracilis* Lamarck, 1816 as the genelectotype, as this species belongs to *Acropora* Reuss, 1869, where Pergens correctly placed it in 1889.

Porinula Levinsen, 1916. Synonym of *Cylindroporella*.

Poristoma Canu, 1907. Synonym of *Bracebridgia*.

Posterula Jullien, 1905. Family Stomachetosellidae.

Prattia D'Archiac, 1847. Family Mamilloporidae.

Prodromopora Lang, 1916. Family Lagynoporidae. Cretaceous cribrimorph.

Prosoporella Marsson, 1887. Pal. Abh., vol. 4, p. 100. Type and only species, *Semiescharipora cornuta* Beissel, 1865. Synonym of *Decurtaria* Jullien, 1886. Cretaceous.

Prosotopora Lang, 1916. Family Rhacheoporidae. Cretaceous cribrimorph.

Prostomaria MacGillivray, 1895. Fossil. Not recognized without more study. Family Prostomariidae MacGillivray, 1895.

Pseudoflustra Bidenkap, 1897. Family Escharellidae.

Pseudostega Brydone, 1918. Family Biflustridae.

Psileschara Busk, 1860. Family Reteporidae.

Psilopsella, new genus. Family Phylactellidae.

Pterocella Levinsen, 1909. Family Catenicellidae.

Puellina Jullien, 1886. Family Costulae.

Pumiscaria Gabb and Horn, 1862. Jour. Acad. Nat. Sci. Phila., ser. 2, vol. 5, 1862, p. 179. Genotype, "*Alveolites glomeratus*" Say. Not recognizable.

Pyriflustrella D'Orbigny, 1853. Bry. Cret., p. 569. First species *Hippothoa tuberculum* Lonsdale, 1845. Not recognized. Founded on poor interpretation of Lonsdale's figure.

Pyriflustrina D'Orbigny, 1853. Bry. Cret., p. 580. Type species, *P. elegans* D'Orbigny, 1853. Cretaceous.

Pyripora D'Orbigny, 1852. Family Electrinidae.

Pyriporella Canu, 1911. Family Alderinidae. Cretaceous.

Pyrulella Harmer, 1926. Family Alderinidae.

Quadricellaria D'Orbigny, 1851. Family Biflustridae.

Quadricellaria Sars, 1863 (preoccupied). Synonym of *Tessaradoma*.

Ragionula, new genus. Family Stomachetosellidae.

Ramphonotus Norman, 1894. Family Alderinidae.

Rectonychocella Canu and Bassler, 1917. Family Opesiulidae.

Reginella Jullien, 1886. Type, *Cribrilina furcata* Hincks, 1882. Family Costulae.

Reptadeonella Busk, 1884. Genotype, *R. violacea* (Johnston). Synonym of *Adeona*.

Reptelectrina D'Orbigny, 1852. Bry. Cret., p. 333. Synonym of *Electra*.

Repteschareila D'Orbigny, 1852. Bry. Cret., p. 464. First species described and figured, *R.* (*Escharina*) *lorieri* D'Orbigny, 1852. Cretaceous cribrimorph.

Repteschareillina D'Orbigny, 1852. Bry. Cret., p. 451. Selected genotype, *R. horrida* D'Orbigny, 1852. Idem, p. 456, pl. 715, figs. 7–9. Cretaceous.

Reptescharinella D'Orbigny, 1852. Bry. Cret., p. 429. Genotype selected by Lang *Cellepora subgranulata* Hagenow, 1851. Cretaceous.

Repteschariopora D'Orbigny, 1853. Bry. Cret., p. 489. Genotype, *R. meudonensis* D'Orbigny, 1853. Pl. 719, figs. 17–19. Costulae. Cretaceous. Type lost.
Reptocelleporaria D'Orbigny, 1852. Bry. Cret., p. 421. Genotype, *R. cretacea* D'Orbigny, 1852. Cretaceous.
Reptoflustra D'Orbigny, 1852. Bry. Cret., p. 327. First species, *Flustra impressa* Lamouroux=*Calpensia impressa.* Not recognized.
Reptoflustrella D'Orbigny, 1853. Bry. Cret., p. 570. First species, (described but not figured) *R. cenomania* D'Orbigny. Cretaceous. Not recognized.
Reptoflustrina D'Orbigny, 1853. Bry. Cret., p. 581. First species, *R. marginata* D'Orbigny 1853. No generic characters. Synonym of *Callopora.*
Reptolatereschara D'Orbigny, 1852. Bry. Cret., p. 417. Both recent species (*Eschara annularis* Moll and *Reptolatereschara capensis* D'Orbigny) referred here by D'Orbigny are now placed elsewhere. No generic characters given.
Reptolunulites D'Orbigny, 1852. Bry. Cret., p. 356. A form of *Lunulites* in which growth has been upon large objects and therefore appears incrusting.
Reptoporella D'Orbigny, 1853. Bry. Cret., p. 474. Type species, *R. regularis* D'Orbigny, 1853, Idem, p. 475, pl. 717, figs. 6, 7. Senomanian of France. Cretaceous cribrimorph. See Lang, 1921, p. lxv.
Reptoporellina D'Orbigny, 1853. Bry. Cret., p. 477. First species, *Cellepora heckeli* Reuss, 1848. Synonym of *Adeona.*
Reptoporina D'Orbigny, 1852. Bry. Cret., p. 441. Numerous species referred to this genus by D'Orbigny but the only one described and figured by him is *Escharina micropora* D'Orbigny, 1847. (Prod. Pal., p. 263 and 1852. Bry. Cret., p. 444, pl. 605, figs. 5–7). The figures represent a Membranipora with closed cells. Not recognized.
Retepora Imperato, 1599. Family Reteporidae.
Reteporella Busk, 1884. Subgenus of *Retepora.*
Retiflustra Levinsen, 1909. Family Flustridae.
Reussia Neviani, 1895. Subgenus of *Smittina.* The two species cited are incompletely figured.
Reussina Neviani, 1895. Genotype *Eschara polystomella* Reuss, 1847. Synonym of *Adeonella.*
Rhabdopora Lang, 1916. Family Calpidoporidae. Cretaceous cribrimorph.
Rhabdozoum Hincks, 1882. Family Scrupocellariidae.
Rhacheopora Lang, 1916. Family Rhacheoporidae. Cretaceous cribrimorph.
Rhagasostoma Koschinsky, 1885 (Levinsen, 1909). Family Aspidostomidae.
Rhammatopora Lang, 1915. Family Electrinidae?
Rhamphostomella Lorenz, 1886. Family Smittinidae.
Rhebasia Jullien, 1881. Genotype, *Eschara dorilas* D'Orbigny, 1851. Bry. Cret., pl. 677, figs. 4–6. Cretaceous. Incompletely known.
Rhiniopora Lang, 1916. Family Pelmatoporidae. Cretaceous cribrimorph.
Rhynchopora Hincks, 1877, preoccupied. See *Rhynchozoon.*
Rhynchotella Canu, 1900. Synonym of *Ramphonotus.*
Rhynchozoon Hincks, 1891. Family Reteporidae.
Romancheina Jullien, 1888. Family Escharellidae.
Rosseliana Jullien, 1888. Family Opesiulidae.
Salicornaria Schweigger, 1819. Synonym of *Cellaria.*
Salpingia Coppin, 1848. Synonym of *Aetea.*
Sandalopora Lang, 1916. Family Pelmatoporidae. Cretaceous cribrimorph.
Sarsiflustra Jullien, 1903. Family Flustridae.
Savignella Van Beneden, 1850. Synonym of *Scrupocellaria.*
Savignyella Levinsen, 1909. Synonym of *Catenaria.*
Schismopora MacGillivray, 1888. Family Celleporidae.

Schismoporella Gregory, 1893. Genotype, *Cellepora schizogaster* Reuss, 1847. Tortonian of Austria. Structure of type incompletely known.

Schistacanthopora Lang, 1916. Family Andrioporidae. Cretaceous cribrimorph.

Schizaropsis Canu and Bassler, 1917. Family Galeopsidae.

Schizellozoon Canu and Bassler, 1917. Family Reteporidae.

Schizemiella Canu and Bassler, 1917. Family Stomachetosellidae.

Schizobathysella Canu and Bassler, 1917. Family Crepidacanthidae.

Schizobrachiella Canu and Bassler, 1920. Family Escharellidae.

Schizolavella Canu and Bassler, 1920. Family Escharellidae.

Schizomavella Canu and Bassler, 1920. Family Escharellidae.

Schizopodrella Canu and Bassler, 1917. Family Escharellidae.

Schizoporella Hincks, 1877. Family Escharellidae. Preserved for species incompletely studied.

Schizoporellopsis Maplestone, 1898. Proc. Royal Soc. Victoria, vol. 2 (new ser.), pt. 1, 1898, p. 21. Genotype, *S. abnormis* Maplestone, 1898. Structure incompletely known.

Schizoretepora Gregory, 1893. Family Reteporidae. Probably the same as *Schizellozoon.*

Schizorthosecos Canu and Bassler, 1917. Family Orbituliporidae.

Schizostoma Canu, 1907, (not Lea 1842). See *Schizostomella,* new name.

Schizostomella new name. Family Adeonidae.

Schizotheca Hincks, 1877. Family Reteporidae.

Sclerodomus Levinsen, 1909. Family Sclerodomidae.

Scorpiodina Jullien, 1886. Family Costulae. Requires further study.

Scruparia Oken, 1815. Family Scrupariidae.

Scrupocellaria Van Beneden, 1845. Family Scrupocellariidae.

Scuticella Levinsen, 1909. Family Catenicellidae.

Scutularia Busk, 1860. Only species *S. prima* Busk (nomen nudum).

Selbia Gray, 1843. Synonym of *Caberea.*

Selenaria Busk, 1854. Family Opesiulidae.

Selenariopsis Maplestone, 1912. Family Opesiulidae.

Semicelleporaria D'Orbigny, 1852. Bry. Cret., p. 420. First species, *Cellepora cucullina* Michelin. Fossil incompletely figured and never rediscovered.

Semieschara D'Orbigny, 1852. Bry. Cret., p. 364. Genotype, *S. flabellata* D'Orbigny, 1852. Idem, p. 367, pl. 708, figs. 1–4. Used for zoarial forms.

Semiescharella D'Orbigny, 1852. Bry. Cret., p. 462. Type, *S. flexuosa* D'Orbigny, 1852. Idem, p. 462. Type not figured. Waters, 1905, recognized it as *Eschara pallasiana* Moll, 1803.

Semiescharellina D'Orbigny, 1852. Bry. Cret., p. 449. Type, *S. mumia* D'Orbigny, 1852. Idem, p. 450, pl. 714, figs. 17–20. Type lost. Genus not recognized.

Semiescharinella D'Orbigny, 1852. Bry. Cret., p. 427. Type, *S. complanata* D'Orbigny, 1852, Idem, p. 427, pl. 714, figs. 1–4. The figure and specimens do not correspond. The name had best be dropped.

Semiescharipora D'Orbigny, 1852. Bry. Cret., p. 479. Lang, 1917 has chosen *S. complanata* D'Orbigny, 1852 p. 484, pl. 718, figs. 17–20, as the type. This is an uncertain species and the generic name should be dropped. Cretaceous.

Semiflustra D'Orbigny, 1852. Bry. Cret., p. 326. First species, *Flustra bombycina* Solander, 1787, not recognized. The second species (*S. frondiculosa*) has never been figured. The third is *Flustra carbasea* Ellis and Solander, 1786. Genus may therefore be considered a synonym of *Carbasea.*

Semiflustrella D'Orbigny, 1853. Bry. Cret., p. 563. First species, *S. rhomboidalis* D'Orbigny, 1852. Idem, p. 564, pl. 730, figs. 5–8, Cretaceous.

Semiflustrina D'Orbigny, 1853. Bry. Cret., p. 576. First species, *S. monilifera* D'Orbigny, 1855. Idem, p. 577, pl. 732, figs. 6–9. Included in *Callopora*. Cretaceous.

Semihaswellia Canu and Bassler, 1917. Family Galeopsidae or Sclerodomidae.

Semiporina D'Orbigny, 1852. Bry. Cret., p. 439. First species, *S. elegans* D'Orbigny 1852. Idem, p. 440 described but not figured. Second species, *Vaginopora fissurella* Reuss, 1848. Foss. Polyp. du Wiener, pl. 9, fig. 5. Miocene of Austria, not rediscovered by Manzoni.

Sertella Jullien, 1903. Subgenus of *Retepora*.

Setosella Hincks, 1877. Family Setosellidae.

Setosellina Calvet, 1906. Family Hincksinidae.

Siniopelta Levinsen, 1909. Synonym of *Costazzia*.

Siphonella Hagenow, 1851. Bry. Maastricht Kreide, p. 83. First species, *S. cylindrica* Hagenow, 1851. Idem, p. 84, pl. 6, figs. 5. Cretaceous. Incompletely known.

Siphonicytara Busk, 1884. Family Tubucellariidae.

Siphonoporella Hincks, 1880. Family Steganoporellidae.

Smittia Hincks, 1880, preoccupied. See *Smittina*.

Smittina Norman, 1903. Family Smittinidae.

Smittipora Jullien, 1881. Family Opesiulidae. A Cretaceous genus founded on a poor interpretation of a figure of Smitt.

Smittistoma Canu, 1907. Family Adeonidae.

Solenophragma Marsson, 1887. Pal. Abh., vol. 4, p. 54. Type and only species *Solenophragma baculina* Marsson, 1887 (not D'Orbigny), Cretaceous.

Solenopora Maplestone, 1903 (preoccupied). See *Aulopocella*.

Sparsiporina D'Orbigny, 1852. Family Reteporidae.

Sphaerophora Haswell, 1881. Family Orbituliporidae.

Sphenella Duvergier, 1924. Family Escharellidae.

Spiralaria Busk, 1861. Family Flustridae.

Stamenocella Canu and Bassler, 1917. Family Alderinidae.

Steganoporella Smitt, 1873. Family Steganoporellidae.

Steginopora D'Orbigny, 1853. Bry. Cret., p. 499. Genotype, *S. ornata* D'Orbigny, 1853. Cretaceous. Costulae. Referred by Lang to Pelmatoporidae.

Stenopsis, new genus. Family Galeopsidae.

Stenosipora, new genus. Family Mamilloporidae.

Stenostomaria MacGillivray, 1895. Subgenus of *Strophipora*.

Stephanollona Duvergier, 1921. Family Escharellidae.

Stephanopora Kirkpatrick, 1888. Family Escharellidae.

Stephanosella Canu and Bassler, 1917. Family Escharellidae.

Stichocados Marsson 1887. Pal. Abh., vol. 4, p. 101. Type and only species, *S. verruculosus* Marsson, 1887. Idem, p. 101, pl. 10, fig. 15. See Lang, 1922, p. 174. Costulae. Cretaceous. Referred by Lang to Pelmatoporidae.

Stichopora Hagenow, 1851. Bry. Maastricht Kreide, p. 100 Genotype. *S. clypeata* Hagenow, 1851. Idem, p. 100, pl. 12, fig. 14, Cretaceous.

Stichoporina Stoliczka, 1861. Family Orbituliporidae.

Stirparia Goldstein, 1880. See *Stirpariella*.

Stirpariella Harmer, 1923. (*Stirparia* Goldstein, 1880, preoccupied). Synonym of *Caulibugula*.

Stolonella Hincks, 1883. Family Beaniidae.

Stomachetosella Canu and Bassler, 1917. Family Stomachetosellidae.

Stomhypselosaria, new genus. Family Cellariidae.

Strongylopora Maplestone, 1899. Family Catenicellidae.

Strophiella Jullien and Calvet, 1903. Family Escharellidae.

Strophipora MacGillivray, 1895. Family Catenicellidae.

Stylopoma Levinsen, 1909. Family Escharellidae.

Synaptacella Maplestone, 1910. Family Synaptacellidae.

Synnotum (Pieper, 1881), Hincks, 1886. Family Epistomidae.

Syringotrema Harmer, 1926. Family Cellariidae.

Systenopora Waters, 1904. Family Sclerodomidae.

Systenostoma Marsson, 1887. Pal. Abh., vol. 4, p. 89. Type and only species, *S. asperulum* Marsson. Idem, p. 89, pl. 9, fig. 2. Cretaceous. Perhaps *Gemellipora* (Waters, 1904).

Taenioporina Marsson, 1887. Pal. Abh., vol. 4, p. 87. Type *Eschara arachnoidea* Goldfuss, 1826. Cretaceous.

Taphrostoma Canu, 1910. Genotype, *T. spinosum* Canu, 1910 Fossil. Family Electrinidae.

Taractopora Lang, 1916. Family Taractoporidae, Cretaceous cribrimorph.

Tata Van Beneden, 1849. Type, *T. rugosa* Van Beneden 1849. Founded upon the primary cells of Membraniporae.

Tegella Levisen, 1909. Family Alderinidae.

Tegminula Jullien, 1882. Family Celleporidae.

Teichopora Gregory, 1893. Genotype (only species), *T. clavata* Gregory, 1893. Trans. Zool. Soc. London, vol. 13, pt. 6, p. 249. Related to *Meniscopora?*

Temachia Jullien, 1882. Family Phylactellidae.

Tendra Nordman, 1839 Genotype, *Tendra zostericola* Nordman, 1839. Family Electrinidae.

Ternicellaria D'Orbigny, 1851. Synonym of *Tricellaria*.

Tessaradoma Norman, 1868. Family Galeopsidae or Sclerodomidae.

Tetraplaria Tenison-Wood, 1878. Family Hippopodinidae.

Teuchopora Neviani, 1895. Genotype, *Alecto castrocarensis* Manzoni, 1875. Fossil. Perhaps Phylactellidae.

Thairopora MacGillivray, 1887. Family Thalamoporellidae.

Thalamoporella Hincks, 1887. Family Thalamoporellidae.

Thoracophora Jullien, 1886. Synonym of *Disteginopora*.

Thoracopora Lang, 1916. Family Thoracoporidae. Cretaceous cribrim

Tremogasterina Canu, 1911. Family Hiantoporidae.

Tremopora Ortmann, 1890. Family Hiantoporidae.

Tremoschizodina Duvergier, 1921. Family Hippopodinidae.

Tremotoichos Canu and Bassler, 1917. Family Galeopsidae.

Tretosina, new genus. Family Electrinidae.

Tricellaria Fleming, 1828. Family Scrupocellariidae.

Tricephalopora Lang, 1916. Family Pelmatoporidae. Cretaceous cribrimorph.

Tricolpopora Lang, 1916. Family Andrioporidae. Cretaceous cribrimorph.

Trigonopora Maplestone, 1902. Figure not recognizable.

Trilophopora Lang, 1916. Family Andriporidae. Cretaceous cribrimorph.

Triphyllozoon Canu and Bassler, 1917. Family Reteporidae.

Triporula, new genus. Family Adeonidae.

Trochopora D'Orbigny, 1853. Family Biflustridae.

Trochosodon, new genus. Family Conescharellinidae.

Trypematella Canu and Bassler, 1920. Family Escharellidae.

Trypocella Maplestone, 1902. Genotype, *T. excavata* Maplestone. Proc. Roy. Soc. Victoria, vol. 14, new series, pt. 2, p. 73. Family Escharellidae.

Trypostega Levinsen, 1909. Family Hippothoidae.

Tubiporella Levinsen, 1909. Family Tubucellariidae.

Tubucella Canu and Bassler, 1917. Family Tubucellariidae.
Tubucellaria D'Orbigny, 1852. Family Tubucellariidae.
Tuliparia Blainville, 1834. Synonym of *Pasythea.*
Turritigera Busk, 1884. Family Lekythoporidae.
Ubaghsia Jullien, 1886. Family Costulae. Referred by Lang to Pelmatoporidae.
Ulidium Searles Wood, 1844. Synonym of *Melicerita.*
Umbonella Hincks, 1889, preoccupied. See *Umbonula.*
Umbonula Hincks, 1880. Family Smittinidae.
Uniretepora D'Orbigny, 1853. Bry. Cret., p. 820. Genotype, *Retepora granosa* Michelin, 1847. Icon. Zoophyt. p. 315, pl. 76, fig. 2, Miocene of Touraine, France. The figure appears to represent an alteration of *Hornera.*
Urceolipora MacGillivray, 1880. Family Euthyridae.
Valdemunitella Canu, 1900. Bull. Geol. Soc. Trans., ser. 5, vol. 28, p. 369. Genotype, *Membranipora valdemunita* Hincks, 1885. Family Alderinidae.
Velumella Canu and Bassler, 1917. Family Opesiulidae.
Verminaria Jullien, 1888. Family Calpensiidae.
Vibracella Waters, 1891. Family Opesiulidae.
Vibracellina Canu and Bassler, 1917. Family Hincksinidae.
Vibraculina Neviani, 1895. Synonym of *Jaculina* Jullien, 1903. *Vibraculina* is not adopted because founded on false characters, the genotype not having vibracula.
Vincularia Defrance, 1829. Dict. des Sci. Nat., vol. 58, p. 214. Type species, *Vincularia fragilis* Defrance, 1829, Idem, vol. 58, p. 214; atlas, pl. 67, figs 3*a-b*. No generic determination. Refer to rod-like forms and now used only as a nomenclatorial term. See *Heterocella.*
Vincularina D'Orbigny, 1851 Bry. Cret., p. 91. First species described, *V. sulcata* D'Orbigny, 1851. Idem, p. 82, pl. 601, figs. 4–6. Cretaceous. According to Canu the figures and specimens do not correspond. The other species of the genus are based on worn specimens or the figures are ideal restorations. The genus had better be dropped.
Vittaticella Maplestone, 1900. Family Catenicellidae.
Watersia Levinsen, 1909. Family Bugulidae.
Watersipora Neviani, 1895. Family Hippopodinidae.
Woodipora Jullien, 1888. Family Thalamoporellidae.
Zeuglopora Maplestone, 1909. Family Conescharellinidae.

DESCRIPTION OF PLATE

All of the figures are magnified twenty diameters

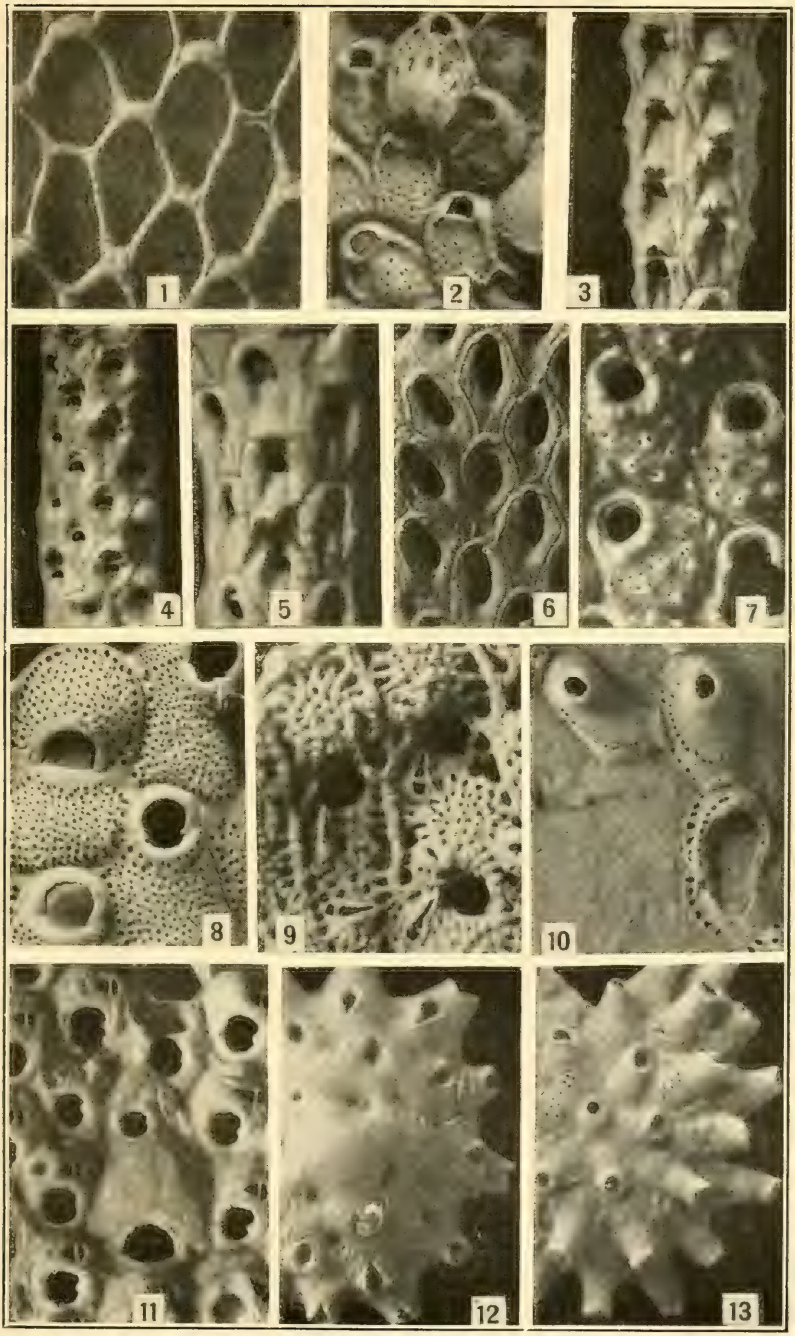
Page

FIG. 1. *Aplousina gigantea*, new genus and species---------------------- 8
The incrusting zoarium showing small endozooecial ovicells and absence of spines and of avicularia.
Albatross Station D. 2405. Gulf of Mexico.

2. *Monoporella fimbriata*, new species------------------------------ 4
Surface with one ovicelled zooecium, illustrating the hyperstomial ovicell surrounded by costules, the aperture with two small lateral indentations and the porous cryptocyst with two perforating opesiules.
Albatross Station D 5151. Sirun Island, Philippines.

3. *Stomhypselosaria condylata*, new genus and species-------------- 4
Zoarium with ovicelled zooecia. The endotoichal ovicell opens by a wide semicircular orifice.
Albatross Station D. 5574. Simaluc Island, Philippines.

O



THE CHEILOSTOMATOUS BRYOZOA

FOR EXPLANATION OF PLATE SEE PAGES 41 AND 42

POLYCHAETOUS ANNELIDS FROM FIJI, SAMOA, CHINA, AND JAPAN

By A. L. Treadwell

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The following paper is a taxonomic study of three collections of polychaetous annelids. The first was made by myself in 1920 on an expedition to the Pacific of the department of marine biology of the Carnegie Institution of Washington, Dr. A. G. Mayor, director. Collecting was done in and around the harbor of Suva, Fiji, and in the harbor of Pango Pango, on the Island of Tutuila, in American Samoa. A description of the Leodicidae of this collection appeared in 1922. (Treadwell, 1922.) A second lot is from Japan and a third from China, the two latter having been sent me for study by Dr. Waldo L. Schmitt of the United States National Museum. All specimens noted as collected by N. Gist Gee are from China and the only locality information further than this is what is indicated in the description of the species. For the others "Japan" is the extent of my information.

A tabulation of the families and species represented is as follows:

Family	Species
Amphinomidae	*Eurythoe complanata* Pallas (*E. pacifica* Kinberg).
	Hermodice pennata Treadwell, var. *tutuiliensis*, new variety.
	Notopygos andrewsi Monro.
	Amphinome rostrata Kinberg.
Polynoidae	*Iphione ovata* Kinberg.
	Lepidonotus squamatus Linnaeus.
	Thormora trissachaeta Grube.
	Halosydna vexillarius Moore.
	Halosydna oculata, new species.
	Harmothoe villosa, new species.
Phyllodocidae	*Phyllodoce pulla*, new species.
	Phyllodoce violacea, new species.
	Phyllodoce fusca-cirrata, new species.
	Phyllodoce tenera Grube.
Hesionidae	*Leocrates iris* Grube.
Nereidae	*Nereis tongatabuensis* McIntosh.
	Nereis pelagica Linnaeus.
	Nereis pusilla Moore.
	Nereis paucidentata Moore.
Leodicidae	*Leodice aphroditois* Pallas.
	Lysidice collaris Grube.
Sabellidae	*Eurato punctata*, new species.
Terebellidae	*Loimia montagui* Grube.
Serpulidae	*Pomatostegus latiscopus* v. Marenzellar.

Family AMPHINOMIDAE

Genus EURYTHOE Kinberg

EURYTHOE COMPLANATA Pallas

Aphrodita complanata PALLAS, 1766, p. 109, pl. 8, figs. 19–26.

Seven specimens are in the collection from Pango Pango, Samoa, only one of which is well developed. This measures 85 mm. in length and 7 mm. in greatest width. In the Japan collection is one specimen conforming to the description of the species and, in a separate bottle, a number of others in which no trace of eyes could be seen. I have assumed that this loss is only apparent and due to the preserving methods employed.

It seems certain that some if not all of these are identical with *E. pacifica* of Kinberg (1857, p. 14) but I have followed Chamberlin, who (1919, pp. 28, 29) discusses the synonymy and concludes that the following should all be grouped as *complanata; E. pacifica, kamahamecha*, and *corallina* of Kinberg; *E. pacifica*, var. *levukaensis* of Fischli; and *E. alcyonia* of Gravier.

Genus HERMODICE Kinberg

HERMODICE PENNATA Treadwell, var. TUTUILENSIS, new variety

Hermodice pennata TREADWELL, 1906, p. 1165, fig. 41.

The variety differs from the species in that the triangular median portion of the caruncle is much smaller and neither pair of eyes is obscured by the caruncle. The caruncle is much smaller in extent than in the species, extending not quite to the posterior border of the second setigerous somite. The outer and inner paired tentacles are about equal in size and much smaller than the median unpaired, the inner paired lying close to the anterior pair of eyes. The first ventral cirrus is no longer than any others. In addition to the longitudinal pink lines on the dorsal surface, a pinkish band surrounds each notopodium at its base.

Three specimens, one regenerating the anterior eight somites were collected at Pango Pango, Samoa. The largest is 55 mm. long and (not counting the parapodia) has a body width of 5 mm.

Genus AMPHINOME Brugiere

AMPHINOME ROSTRATA Kinberg

Amphinome rostrata KINBERG, 1857 p. 12.

Chamberlin (1919 p. 27) lists this species as *A. vagans* Savigny and gives the synonymy. I have followed McIntosh (1885, pp. 21 to

24, pl. 1, fig. 7; pl. 4, fig. 1; pl. 1*a*, fig. 16; pl. 2*a*, figs. 8 to 12), in assigning it to *rostrata*.

One specimen collected at Pango Pango, Samoa.

Genus NOTOPYGOS Grube

NOTOPYGOS ANDREWSI Monro

Notopygos andrewsi Monro, 1924, pp. 73–75, figs. 5 and 6.

I had described and figured what seemed to be a new species of this genus when Monro's description of *N. andrewsi* appeared, and it is evidently the same species. Since the description I had prepared adds some data to that of Monro's I have decided to let it stand as originally written.

Two varieties of this species appeared in my collection. The first is colorless except for a narrow band of bluish gray pigment across the anterior face of the base of the notopodium in the anterior body somites, disappearing toward the posterior end of the body. In the two specimens representing this variety the anal opening is on the anterior margin of setigerous somite 23. Two specimens also represent the other variety, and in them the anal opening is on the anterior margin of setigerous somite 24. They are marked on the entire dorsal surface with blotches of bluish gray. In a general way, these blotches may be described as consisting in each somite of a band running across both the anterior and posterior dorsal margins, extending out on to the bases of the parapodia; and as four patches on the dorsal surface, two on either side of the mid-line, the posterior much the larger of the two, and much more irregular in outline. The center of each larger patch is lighter colored than the margin, and in the smaller individual these patches are in the form of rings. Both sets of patches connect irregularly with the lateral bands. Since the specimens agree in all other respects I consider these as at most varietal differences and in view of the limited number of specimens (4) consider it best to describe them as one species, without giving them varietal names.

According to my record, one specimen of each variety was taken at Pango Pango, and the same number at Suva, Fiji. It is possible that there was a confusion of labels in transferring these, and that both of the second variety came from Suva, in which case these could be regarded as geographical varieties, but to the best of my knowledge each locality yielded one of each kind. The type was collected at Pango Pango.

In one specimen, the body is 45 mm. long, widest about midway, where it measures 8 mm. From here it tapers gradually to a width

of 4 mm. at the prostomium and more sharply to 2 mm. on the anal somite. There are 28 somites.

The caruncle (fig. 1) is divided longitudinally into a median and two lateral sections, the three being in contact anteriorly and posteriorly but widely separated throughout the greater part of their length. The median portion has a narrow central axis, with about 30 vertical lobes along either margin. Each lateral portion is a vertical lamella, bent so as to form about 20 close loops. Posteriorly the three sections unite to form a pointed end, just over the anterior margin of somite 6, the posterior point of attachment of the caruncle being on somite 4. Anteriorly the lateral portions merge into the margins of the prostomium, while the median portion, which throughout is higher than the others, is continued over the prostomium as a crest, ending in a rounded smooth lobe at the level of the anterior pair of eyes.

The unpaired tentacle is attached near the anterior end of this median division of the caruncle. It is slender and inconspicuous and extends to the posterior margin of setigerous somite 2. There are two pairs of prominent black eyes, the anterior ones slightly the larger, and situated in front of, and anterior to, the end of the caruncle. The posterior eyes are about as far from the anterior ones as these are from one another. The dorsal paired tentacles are similar in form and size to the median unpaired, and lie one on either side just in front of the anterior eye. From the base of each paired dorsal tentacle a ridge runs forward to merge with the anterior border of the prostomium. These diverge a little from one another so that the groove between them is widest at the anterior end. They merge into the surface of the upper lip which has no groove in its anterior margin. In the channels between these two ridges, and in a similar depression on either side is an accumulation of dark pigment, colored much like the eyes. The ventral paired tentacles are similar in form to the dorsal and lie between the anterior margin of the first setigerous somite and the pigmented channel. Aside from the above-mentioned pigment, the only trace of color is a narrow band on the anterior face of each notopodium of anterior somites. These are darkest in the anterior somites, become less intense farther back, and eventually disappear entirely at about the middle of the body.

On the ventral surface is a very shallow and broad median groove. The anterior margin of the fourth somite bounds the mouth posteriorly; anteriorly and laterally it is bounded by the narrow hoof-shaped upper lip, which is formed by setigerous somites 1 and 2, while its lateral margin on either side is formed by setigerous somite 3.

The gills appear first as relatively thick, finger-shaped filaments on the fifth setigerous somite. In the type there are six of these filaments on the right side, while those of the left side have been injured and the number is of no significance. In these first gills the filaments arise independently of one another, but in later gills they arise in bunches looking like the " hands " of a banana bunch, though some of the filaments may be branched. There are two of these " hands " each having about eight filaments and the outer one which is the larger bends over (in preserved material) and incloses the inner one. The gills occur on all somites posterior to the fifth setigerous though the number of filaments decreases toward the posterior end of the body.

In the parapodia the noto and neuro-podia are well separated. The gill is situated toward the posterior margin of the notopodium and a very delicate slender cirrus lies anterior to it. (Fig. 2 in which a very small portion of the gill is shown.) The notopodial setae arise in a circle inclined at an angle of about 45° with the perpendicular and a long cirrus-like lobe extends out from the center of this circle. By some writers this has been described as a second dorsal cirrus but it seems to me not homologous with a dorsal cirrus, but to be merely an outgrowth of the setal lobe. It extends from the body about as far as do the setae. The neuropodial setae form a smaller tuft than do the notopodial, the basal outline of the tuft being oval. The ventral cirrus is similar in form to the dorsal but is shorter than it. In anterior somites they are much larger than they are posteriorly. The setae are all alike, unequally forked at the end. (Fig. 3.)

In addition to the individuals above mentioned, the collection contains one specimen of the unpigmented variety, collected on Utilei reef, Pango Pango by F. A. Potts.

Family POLYNOIDAE

Genus IPHIONE Kinberg

IPHIONE OVATA Kinberg

Iphione ovata KINBERG, 1857 to 1910, p. 8, pl. 3, figs. 8, 8*a* to 8*h*; pl. 10, figs. 45 to 45*e*.

Kinberg's specimens were 12 mm. long and 7 mm. wide, and were collected in Honolulu. Chamberlin (1919 p. 64), described one specimen from Paumotu Island, measuring 17 mm. in length by 10 mm. in width. My collection includes two individuals, the larger of which is 25 mm. long and 10 mm. wide. The smaller is broken and measurements are of little significance. Mine were collected in Suva Harbor, Fiji.

Genus LEPIDONOTUS Leach

LEPIDONOTUS SQUAMATUS Linnaeus

Aphrodita squamata LINNAEUS, 1766, p. 1084.

One small specimen collected at Pango Pango, Samoa.

Genus THORMORA Baird

THORMORA TRISSOCHAETA Grube

Lepidonotus trissochaetus GRUBE, 1869, pp. 485, 486; 1878, pp. 25, 26, pl. 2, fig. 4.

Grube (1869) described this species from collections made by Ehrenberg in the Red Sea. Later (1878) he wrote a furthur description with a few figures, from material collected in the Philippines. It seems quite certain that this is identical with specimens in my own collections, but I have added the following descriptions and figures to what Grube has written.

These specimens have two forms of setae in the notopodium, and the elytra leave a portion of the mid-dorsal line of the body uncovered, in both of which points they differ from the usual diagnosis of *Lepidonotus*, and agree with Baird's (1865, p. 199), diagnosis of a new genus *Thormora.* I have, accordingly listed them under this genus. It should be noted that the double nature of the notopodial setae is not always clearly seen. The smaller, smooth margined setae are quite obvious in some specimens, while in others it was necessary to examine a number of parapodia before any were found. I have no information as to whether there is any regular discontinuity in their distribution along the animal, but think there is not, and that this was an individual variation. To determine this point would involve destroying a considerable number of specimens which I did not have at my disposal. It would, however, be safe to suspect that a *Lepidonotus-like Polynoid* with a bare dorsal surface has two kinds of dorsal setae.

The prostomium (fig. 4), is small, not more than 0.6 mm. in width, its width being slightly greater than its length. The dorsal surface is without pigment but is faintly iridescent. Its posterior border is covered by a nuchal fold from the anterior border of the first somite. The posterior eyes are near the border and are obscured by the nuchal fold, while the anterior eyes are situated at the widest part of the prostomium and are larger than the posterior. On the dorsal surface of the prostomium is a distinct depression, widest at the anterior border of the prostomium and running posteriorly nearly to the middle of the latter. The ceratophore of the median tentacle fits into this depression. The lateral tentacular ceratophores are slender, about half as long as the prostomium, and are dark gray in tone, with the margin of the apex

uncolored. The terminal joint is fully as long as the prostomium, its filamentous apical region being nearly as long as its basal portion. The latter narrows slightly from the base, then widens into a globular swelling which is followed by the filamentous portion. It is colored brown from its base to about half way up the swollen portion with the remainder uncolored. The ceratophore of the median tentacle is about twice as wide as that of the lateral and extends to a short distance beyond it. The terminal joint of the median tentacle is fully twice the size of either lateral, but resembles them in form though the terminal filament is relatively much shorter. The bulbous portion of the median tentacle is about at the level of the anterior end of the lateral ones. The two tentacular cirri of the same side resemble one another in form and size and are about the size of the median tentacle. They are pigmented only on a narrow band just proximal to the bulbous swelling. The palps are large, extending to a distance of about twice the length of the median tentacle and taper uniformly from the base to the apex, where they end in a filamentous tip. Their surfaces are unpigmented and are covered with densely arranged and relatively large, "cilia."

The body is mostly without color. On the mid-dorsal line of each somite is a patch of dark pigment made up of minute transverse parallel lines. In anterior somites these are darkest near the anterior border of the somite extending as a diffuse patch toward the posterior border. Toward the middle of the body this pigment appears as a small, dark, median patch with its long axis parallel to the axis of the body and a diffuse patch forming a "wing" on either side. All elytra show some pigment. In the type specimen the first four are faintly pigmented, the fifth to the eleventh, inclusive, intensely so, the twelfth, again, has very little color. The distribution of the pigment is the same in all elytra (fig. 5), the pigmented area occupying a little more than one quarter of the surface. It begins in the form of a blunt point near the anterior end of the elytron and covers the whole extent of its dorsal margin and extending inward from this in a gradually widening area which abruptly ends at about the level of the beginning of the pigment patch on the following elytron. Under low magnification this pigment is seen to be broken up into angular areas, each with a colorless spot in the center. There are 12 pairs of elytra overlapping one another on the same side, leaving the mid-dorsal surface of the body uncovered. They are approximately of the same form throughout the body, have entirely smooth margins, and are translucent except where pigmented. There is a single row of minute spines near the latero-anterior border with a few similar spines irregularly arranged elsewhere on the surface. (Fig. 5.)

The notopodium (fig. 6) is rudimentary and has a single acicula. On its dorsal surface is a small tuft of setae of two kinds. The larger ones are bluntly rounded at the apex and have a number of transverse rows of minute teeth continued nearly to the tip. (Fig. 7.) The smaller ones are slightly swollen toward the apex but narrow to an acute point, and have smooth margins. They are figured by Grube (1878, fig. 4*b*) with sufficient accuracy though he exaggerates the depth of the surface depression. The end of the neuropodium is more or less lobed but the anterior and posterior lips are approximately of the same length. There is a single very heavy acicula. The neuropodial setae project to a considerable distance beyond the apex of the neuropodium. They have stout shafts which widen toward the apices and then narrow rapidly and asymetrically to form a blunt point, one side of which is convex, the other slightly concave. At a short distance behind this widened area are 7 or 8 rows of toothed plates (fig. 8). There is no subterminal tooth.

Grube's (1869) description was of specimens labeled merely as from the Red Sea, and he refers to some in the Godeffroy collection "von Samoa und der Vitit-Inseln." Those in his 1878 paper were collected at Bohol in the Philippines. My specimens were collected at both Suva, Fiji, and Pango Pango, Samoa.

Genus HALOSYDNA Kinberg

HALOSYDNA VEXILLARIUS Moore

Halosydna vexillarius Moore, 1903, pp. 415–417; pl. 23, figs. 13, 14, 15.

Moore's description was based on a single specimen. In this present collection from China is one entire individual collected by Dr. N. Gist Gee at Peiyushan Lighthouse Station; with a fragment of another, labeled as from "side saddle." These differ from Moore's description in such details as proportionate length of tentacles, which in view of the limited number observed seem not be of sufficient importance to outweigh the points of agreement.

HALOSYDNA OCULATA, new species

The type specimen is 22 mm. long, with a greatest body width of 2.5 mm., the prostomium being about 1 mm. wide.

The prostomium is slightly wider than long. (Fig. 9.) It is divided by two) (shaped lines into a narrow central region, and two lateral regions, the latter rounded dorsally and dorso-ventrally are thicker than the former. Posteriorly the three areas are confluent, this region being overlapped by a fold from the anterior margin of somite 1. The cirrophore of the median tentacle is a little narrower than the central prostomial area and extends forward from it. It

is about one-half as long as the distinct portion of the central area. The slender terminal joint of the median tentacle is about six times as long as the cirrophore, has a slight swelling near the end, and terminates in a filamentous tip. The cirrophores of the lateral tentacles are closely crowded ventro-laterally to the median and are about equal to it in size. In the type specimen the terminal joint of the left paired tentacle while more slender than the median, resembles it in form and is nearly as long as it is. That of the right side is smaller and is evidently regenerating. The cirrophores of the tentacular cirri are long and slender, their terminal joints shaped like those of the tentacles. The palps are slender and about twice as long as the longest tentacles. On either side of the prostomium is what appears to be two large confluent eyes, the anterior of each pair being the larger. In the center of each is a white spot which represents the lens. It is possible that these " eyes " are really dense accumulations of pigment, obscuring the real eyes which lie in the position indicated by the " lenses." They are dark brown in color, contrasting strongly with the general tint of the prostomium, which in preserved material is light brown with numerous darker patches.

On the anterior face of each half of the prostomium at the base of the cirrophore of the lateral tentacle is a patch of pigment. The entire dorsal surface of the body is colored like the prostomium, though the parapodia and all cirri are colorless. The brown spots are more or less irregularly arranged but show a tendency to group themselves into two double rows, one near the anterior and one near the posterior margin of the somite, the portion between the members of the double row appearing as a white line. Other markings occur in the form of more or less irregular transverse lines. This color arrangement is most clearly seen toward the posterior end of the body.

The elytra are translucent and delicate, the first one noticeably smaller than the second. In the type which has its pharynx partially protruded, the second elytron covers the prostomium and extends as far as the apex of the cirrophore of the tentacular cirri while the first elytron is crowded ventrally so as to lie on the lateral face of the prostomium. This may be an abnormal arrangement due to the action of the preserving fluids. There are 19 pairs of elytra and in life they must have met over the dorsum, especially toward the middle of the body. Each has a smooth, more or less wavy outline, the surface being smooth except for the dorsalmost quarter of its area where it is thickly studded with spines, each with a trifid apex. A detail of this region is shown in figure 10.

The parapodia (fig. 11), have pointed setal lobes, into which the aciculae extend, and very small ventral cirri, each globular at the base but with a slender tip. The dorsal cirri are similar in form to

the tentacles. A dorsal acicula comes to the surface at the base of the dorsal cirrus and is surrounded by a tuft of setae. The notopodial setae are straight with smooth margins and taper to a blunt point. (Fig. 12.) The neuropodial setae widen toward the apex terminating in an unsymmetrically bifid apex. The length of the widened portion is least in the most ventrally placed setae of the tuft. On the side of the seta corresponding to the larger terminal branch are a number of slender teeth. A smaller number of somewhat larger teeth occur on the opposite margin. (Fig. 13.)

The species was collected at Pango Pango, Samoa, in 1920. The type is Cat. No. 19141 of the U.S.N.M.

Genus HARMOTHOE Kinberg

HARMOTHOE VILLOSA, new species

The type is 15 mm. long. Owing to the peculiar bristly character of the setae, measurements of the transverse diameter are hard to make but from tip to tip of the setae is 5 mm. The prostomium is not more than 0.5 mm. wide.

The prostomium (fig. 14), has a length about equal to its width, and its anterior margin is excavated for the cirrophores of the tentacles of which the median fills rather more than half the space. The posterior eyes are the smaller and lie near the posterior border of the prostomium, while the anterior ones are situated on the latero-ventral face just at the bases of the anterior peaks, and are visible from above only as seen through the translucent prostomial tissue. The lateral margins of the prostomium are smoothly rounded and meet the outer margins of the anterior depression in blunt points. If continued at their regular curvature they would meet one another at the distal end of the cirrophore of the median tentacle. This latter organ is short, and its style is about twice the length of the prostomium, tapering very slightly to near the end and abruptly terminating in an acute point without any subterminal swelling. The paired tentacles are in width and length less than half the size of the median and arise partly ventral to it. They are pigmented except for the terminal one-third. A similar pigmentation occurs on the basal joint of the median tentacle and there is heavy pigmentation around the mouth. As a consequence the anterior part of the prostomium has a dark tint, shading back to about the region of the anterior eyes. The tentacular cirri are about equal to the lateral median tentacle in size and have very slight subterminal swellings. At the bases of their cirrophores are masses of pigment. The palps extend to about one-third of their length beyond the median antenna. Their surfaces are smooth, but all cirri are thickly studded with villi. (Fig. 15.)

A parapodium from near the middle of the body (fig. 15), has a hemispherical notopodial lobe carrying on its outer margin a conical projection into which the large acicula extends. In the cirrus-bearing parapodia, the cirrus is attached to the extreme dorsal margin of the notopodial lobe, and extends to a short distance beyond the longest setae. The cirrus tapers very gradually until near the end, when it rapidly narrows. Throughout its length, leaving only the slender terminal apex bare, the surface is studded with villi, each equal in length to about one half the transverse diameter of the cirrus. The neuropodium consists of a rounded post-setal and conical pre-setal lobe, the acicula extending into the latter. Beyond the apex of the acicula the lobe extends as a slender finger-shaped process, very much narrower than the main portion of the lobe. The post-setal lobe has the form of a blunt cone. The ventral cirrus is conical and extends to the bases of the ventralmost setae. Its surface is smooth.

The notopodial setae arise in the form of a fan-shaped row from the anterior face of the base of the notopodial lobe, the ventralmost of the row overlapping the anterior face of the neuropodium. They are all alike in form but differ in length. The shaft is stout, ending in a single smooth, terminal, tooth. With the exception of the terminal tooth, the whole seta carries series of regularly spaced thin plates toothed at their margins and attached at an angle to the shaft. These are most clearly seen when in profile, and then (especially in the smaller setae), appear as if there were distinct longitudinal rows, but at least in some cases, they extend entirely around the shaft (fig. 16). The neuropodial setae are about equal in length to the notopodial and have slightly more slender shafts. Toward the end they widen rather abruptly, and then gradually narrow to terminate in a curved apical tooth, with a second, subapical, tooth arising near its base, the subapical tooth being much smaller than the apical. The shaft of the seta and the terminal toothed portion are smooth but the subterminal, wider area carries many toothed plates similar to those found on the notopodial setae. I think that these do not extend entirely around the shaft but leave entirely free a narrow strip on the side corresponding to the convexity of the terminal tooth. (Fig. 17.)

There are 15 pairs of elytra, carried on short stout elytrophores, and they overlap so as to completely cover the dorsum of the animal. The first pair had been lost. The second pair are kidney shaped with a rather wide depression on the outer lateral margin. This depression disappears in later elytra which are broad oval in outline. The second pair are pigmented for rather more than one quarter of their surface. In preserved material this pigment is a

very dark green as seen with transmitted light, and numerous small black dots, marking the position of short spines, are scattered over its surface. In later somites the pigment is more diffusely scattered though the greater bulk is always toward the dorsal margin of the elytron. Figure 18 was taken of the fourth elytron. The margin is entire. The surface is dotted with short spines, each with a dark central axis when located in the pigmented area but colorless elsewhere. A single row of larger and more distinct spines lies along the colorless margin.

Collected at Pango Pango, Samoa and one incomplete specimen was found at Suva, Fiji.

The type came from Pango Pango and is Cat. No. 19142 in the U.S.N.M.

Family PHYLLODOCIDAE

Genus PHYLLODOCE Savigny

PHYLLODOCE PULLA, new species

A single specimen, measuring not less than 170 mm. in length, and 1.5 in body width. Because of the twistings of the body accuracy in measurements of this preserved material is quite impossible.

The general color effect is that of a light brown. The anterior region of the body is dark iridescent violet but this weakens in later somites and practically disappears by the middle of the body. All cirri and parapodia and the entire ventral surface of the body, are brown in color.

The prostomium (fig. 19), is cordate in outline with a rounded apex, and with a triangular posterior incision, the latter nearly filled by a large nuchal papilla. On either side of the papilla is a rounded pedicle-like connection between the prostomium and the first somite. One pair of large eyes showing no trace of lenses, lie opposite the anterior end of the posterior incision. The prostomium is light-brown in color, contrasting in this respect with the iridescent violet of the following somites. The tentacles are all alike in form, rather stout, and about one-third as long as the prostomium. The tentacular cirri have light-brown cirrophores, the styles being a trifle darker in tint. The longest is the single one carried on somite 2, and it extends to the tenth setigerous somite.

The parapodium (fig. 20) has a single setal lobe with longer anterior than posterior lip, and a single acicula. The dorsal cirrus is asymmetrically lanceolate and erect. There is much less difference in the sizes of the dorsal and ventral cirri in this species than in *P. variegata*. (See below.)

The setae (fig. 21) are slender, the basal joint having a beveled end with a few spikes, the terminal joint rather long, curved, with teeth along its convex edge.

In the taxonomy of *Phyllodoce* the character of the proboscis is important, but neither in this nor the following species was this organ protruded.

The specimen was labeled as No. 15 in the Japan collection. The type is Cat. No. 19143 in the collections of the U.S.N.M.

PHYLLODOCE VIOLACEA, new species

While collecting on the coral rocks in the harbor of Suva, Fiji, my companion, F. A. Potts, called my attention to a large number of Phyllodocids lying on top of the rocks left bare by the outgoing tide, where they were kept from drying only by the splashing of water over them by an occasional wave. It seemed probable that if they had been in this position before the tide went out they would have been washed away by the waves, but we saw no trace of burrows from which they might have come, and in any case it is not easy to understand why they should have come out of burrows at a time when they might easily have been dried by the sun or caught by birds.

An unusual feature of this species is the great length of the animals. The type after preservation, measures 990 mm. and must in life have been well over 1,000 mm. in length. The largest somites are 1 mm. broad and 0.75 mm. long.

The dorsal surface of the prostomium is, roughly speaking, oval in outline, broken by a small median depression, in which lies a small nuchal papilla, and indented at the point of insertion of the tentacles. (Fig. 22.) If the proboscis is protruded, the prostomium appears shorter and more nearly circular in outline. The tentacles equal one another in size and are about half as long as the prostomium. The eyes are very small and difficult to see. In the type the proboscis is protruded to a length of 7 mm. and is densely studded with dark brown papillae uniformly distributed over its entire surface. There is a small nuchal organ on either side of the prostomium.

The tentacular cirri are short (fig. 22), the longest, the dorsal one on the first somite, extending to somite 7. This one is a trifle more slender than the others. The first cirrus is almost as long as this, the others intermediate between these in length.

To the naked eye the color is throughout a dark brown, but under a lens it is seen to have a brilliant violet iridescence, most intense anteriorly but visible throughout the entire extent of the body. Minute white spots are scattered irregularly over the surface. On the prostomium the iridescence is obscured by a brown pigment which in places allows the iridescence to show, but is denser in an area having roughly an X outline, each anterior arm of the X ending at the base of a dorsal tentacle, the posterior arm on either side running to the postero-lateral angle of the prostomium. The

tentacles, the terminal joints of the tentacular cirri, the ventral cirri, and the margins of the dorsal cirri, are light brown in color, while the cirrophores of the tentacular cirri, and the median areas of all dorsal cirri are dark brown without any trace of iridescence.

Posteriorly the body narrows very decidedly, the anal somite being rather prominent in comparison with the ones immediately preceding it. In specimens which seemed entire I could find no trace of anal cirri.

The parapodium has a setal lobe with anterior and posterior lips, the latter being bifid. (Fig. 23.) The dorsal cirri are thick and firm (in preserved material), and overlap one another posteriorly, leaving a large part of the dorsal surface of the animal uncovered. The setae form a single vertical row.

The setae are all compound, of the type characteristic of this genus. (Fig. 24.) At the apex of the basal joint are some short spines. The terminal joint is relatively short and thick, with very minute denticulations along one edge.

Collected in Suva Harbor, Fiji, and one specimen is in the collection from Japan.

The type is Cat. No. 19144 of the U.S.N.M.

PHYLLODOCE FUSCA-CIRRATA, new species

The type specimen is 150 mm. long, with a greatest body width of 3 mm. about one quarter of the length behind the anterior end. Posteriorly it narrows very decidedly. In the preserved material the main color features are the iridescence of the anterior region and the dense brown pigmentation of all cirri on the posterior region of the body.

The prostomium (fig. 25) is about 1 mm. in diameter on the posterior border, and has a shallow median notch on its posterior margin, into which fits a small nuchal organ. From each rounded postero-lateral angle of the prostomium the lateral margins diverge slightly to the corresponding antero-lateral angle, the large eye on either side lying about its own width nearer the posterior than the anterior angle. The antennae are situated at a distance of about twice their own diameter from the anterior margin of the prostomium and extend as far as the posterior margin of the eyes. They are approximately equal in size. The anterior margin of the prostomium is rounded and prominent, the median antero-posterior diameter is about equal to the greatest prostomial width. A rounded nuchal organ on either side lies just ventral to the eye.

The longest tentacular cirrus is the dorsal one of somite one, its cirrophore extending over two somites and its terminal joint reaching somite 10. The tentacular cirrus of somite 2 reaches somite 9, the

two remaining ones are about equal in length and reach as far as the anterior border of somite 6. In the type the pharynx is partially expanded. On either side it carries six longitudinal rows of semicircular plates, about eight in a row, each plate colored dark brown on its outer margin.

The dorsal cirri are all prominent, asymmetrically lanceolate in outline, attached to a broad cirrophore. Throughout they contain radiating pigmented lines, which in the anterior regions of the body make them much darker than the reddish much arched, iridescent dorsal body-surface. (Fig. 26.) This distinction is intensified posteriorly where the pigment becomes much darker.

The setal lobe of the parapodium has a rounded posterior and longer, asymmetrically cleft anterior lip, with a single acicula and a vertical row of setae coming to the surface between the lips. The ventral cirrus is about as long as the setal lobe and lies posterior to it, which posteriorly it nearly covers. In the figure it is represented as pushed ventrally away from its usual position. The setae are compound, 20 to 25 in number in a vertical row, the basal joint having a bunch of stiff spines and the long slender terminal joint carries on its concave surface a row of rounded denticulations. (Fig. 27.)

In the type the posterior end is missing. In a second specimen of about the same size as the type, there is a gradual decrease in body width until at the posterior end it is not more than 0.25 mm. in diameter, the dorsal and ventral cirri being relatively much larger than they are farther forward. There is a single pair of dark brown anal cirri, as long as the last 4 or 5 somites.

Having pharyngeal papillae arranged in rows, this species would be classed by some taxonomists as *Anaitides* rather than *Phyllodoce.* This structural character seems to me hardly of generic value.

Collected at Pango Pango, Samoa. The type is Cat. No. 19145 in the U.S.N.M.

PHYLLODOCE TENERA Grube

Phyllodoce tenera GRUBE, 1878, p. 97.

Grube gives no figures for this species, and identification is rather difficult from his description but I have doubtfully identified these as belonging here. The animals are noteworthy from the large size of the eyes and the relatively narrow lanceolate dorsal cirri, especially those toward the posterior end of the body. The tentacular cirri are shorter than in Grube's description.

There is a considerable variation in coloration. Some are entirely colorless, while others have a uniformly distributed dark brown tint over the whole anterior region. In general the cirri are dark brown in color, but there seems to be no uniformity in this respect.

Grube's specimens were from the Philippines, mine were collected at Pango Pango, Samoa.

Family HESIONIDAE

Genus LEOCRATES Kinberg

LEOCRATES IRIS Grube

Leocrates iris GRUBE, 1878, pp. 105, 106.

Nine specimens collected at Pango Pango, Samoa, and one at Suva, Fiji. Grube described his species from a specimen collected at Zamboanga in the Philippines but says that it occurs in Samoa. Chamberlain (1919, p. 190) records one specimen from Papeete in the Society Islands.

Family NEREIDAE

Genus NEREIS Cuvier

NEREIS (PLATYNEREIS) TONGATABENSIS McIntosh

Nereis tongatabuensis MCINTOSH, 1885, pp. 212 to 214, pl. 34, figs. 7, 8, 9; pl. 16*a*, figs. 5, 6, 7.

I have identified these on the basis of the body pigmentation, the form of the prostomium, and the length of the tentacular cirri. The first somites are not so narrow in comparison to later ones as McIntosh found in his material, but this may be a matter of preservation. McIntosh's figure 7, plate 34, shows a deep depression between the bases of the tentacles. In my material this is a definite cut, the bases of the tentacles being completely separated as far back as a line drawn horizontally across the middle of the two anterior eyes. In my specimens also, the parapodia do not modify posteriorly as was the case with McIntosh's but retain their sharp-pointed lobes to the posterior end of the body. The setae agree with those in McIntosh's material.

Collected at Pango Pango, Samoa.

NEREIS PELAGICA Linnaeus

Nereis pelagica LINNAEUS, 1767, p. 1086.—EHLERS, 1864 to 1868, pp. 511 to 523, pl. 20, figs. 11 to 20.—v. MARENZELLAR, 1879, p. 14.

v. Marenzellar's specimen is recorded as probably collected at Yokohama. I have doubtfully identified one very small individual collected at Peiyushan Light House by N. Gist Gee, as belonging to this species.

NEREIS PUSILLA Moore

Nereis pusilla MOORE, 1903, pp. 428 to 429, pl. 24, figs. 25, 26, 27.

A single specimen, lacking color, except that in the posterior somites the dorsal surface of each parapodium has a large dark brown patch near the apex, and a much smaller one at the base.

Moore's specimens from Suruga Bay, Japan, are described as having a delicate rose-red tint on anterior somites.

Collected by N. Gist Gee at Shroud Island.

NEREIS PAUCIDENTATA Moore

Nereis paucidentata MOORE, 1903, pp. 430, 431, pl. 24, figs. 28, 29, 30.

A fragment of the anterior end of one specimen undoubtedly of this species.

Collected at "side saddle" by N. Gist Gee.

Family LEODICIDAE

Genus LEODICE Savigny

LEODICE APHRODITOIS Pallas

Nereis aphroditois PALLAS, 1788, p. 229, pl. 5, figs. 1–7.

A single specimen. I have elsewhere (1922, pp. 134 to 136, pl. 1, figs. 12–17, text figs. 3–7), described and figured this species from Samoa, and have given there references to the literature from which it appears that this is a very variable species. This single specimen from Japan does not agree in all details with any others I have seen, or with the various descriptions in the literature, but resembles them all sufficiently closely so that I have placed it in this species. My identification is largely based on the character of the jaws and gills. The dorsal cirri are much more slender than in those I collected in Samoa.

"Japan" is the only locality given.

Genus LYSIDICE Savigny

LYSIDICE COLLARIS Grube

Lysidice collaris GRUBE, 1878, pp. 166 and 167.

A single specimen, collected at Peiyushan Light House Station, by N. Gist Gee.

Family SABELLIDAE

Genus EURATO St. Joseph

EURATO PUNCTATA, new species

Two specimens are in the collection, one, the type, being entire. This has a body-length of 35 mm. and a width of 2.75 mm. and is composed of about 100 somites. The body tapers uniformly and rather sharply to the pygidium which is not more than 0.5 mm. in diameter. In each somite on either side is a pair of dark spots, one dorsal and one ventral to the seta tuft, the dorsal one being the larger and the more prominent. These are the only constant

color features in the body, but colored spots are scattered irregularly over the entire surface, with a tendency to collect in greater numbers near the anterior end. The faecal groove is relatively prominent throughout the entire length of the abdomen, and in the usual fashion, it crosses the ventral face of the anterior abdominal somites to pass to the dorsal surface. The collar is small, straight sided, with a deep notch on either side on the dorsal surface. Toward the median line from these is on either side a rounded lobe, the two not being in contact, and the ventral ends of the collar are prolonged into overlapping lobes. (Fig. 28.) The tentacles are large and between them and the collar, near the mouth, is a pair of prominent rounded lobes.

The gills are carried on prominent bases, which are united for a short distance by a membrane. This membrane, in a line corresponding to a continuation of the free portion of the gill, is colored a deep purple, while between these it is colorless. Throughout their entire extent the gills are marked with alternating bands of purple and white, this coloration extending over the pinnules. A short portion of the apex of each gill is free from pinnules.

The thoracic setae are all essentially alike in form but differ in length and the larger ones are less broadened toward the end than are the shorter. Both (fig. 29) broaden toward the apex, this broadened portion being striated and they terminate in very fine tips. The uncinus (fig. 30) has a bluntly truncated base, a single prominent tooth, and a denticulated apex. Abdominal setae and uncini are similar to the thoracic in form.

Collected at Pango Pango, Samoa. The type is Cat. No. 19146 of the U.S.N.M.

Family TEREBELLIDAE

LOIMIA Malmgren

LOIMIA MONTAGUI Grube

Terebella montagui Grube, 1878, pp. 224 and 225, pl. 12, fig. 3.
Loimia montagui v. Marenzeller, 1884, pp. 9 to 11, pl. 2, fig. 1.

As was noted by v. Marenzeller, Grube's description of this species is not very satisfactory and I have based my identification mostly on the description given by the former writer, the important details being the structure of the lobes on the second and third somites, the gills, and the form and arrangement of the setae. Black intersegmental bands mentioned by Grube do not appear in my material. The tubes have a basal structure of tough material thickly covered on the outside by small pebbles and bits of shell.

Grube's specimen is recorded as collected at "Canal Lapaing, Philippinen." v. Marenzeller states that his were collected by Dr.

A. v. Roritz who is credited in an earlier paper (v. Marenzeller, 1879, p. 1) with collections made at Yokohama and at various places on the islands Kiuschiu and Shikoku, but the paper contains no more definite locality data. Mine were collected at Pango Pango, Samoa.

Family SERPULIDAE

POMATOSTEGUS Schmarda

POMATOSTEGUS LATISCAPUS v. Marenzeller

Pomatostegus latiscapus v. MARENZELLER, 1884, pp. 22, 23, pl. 4, fig. 5.

A single specimen, incomplete posteriorly. v. Marenzeller's description is very brief and possibly a comparison with the type would reveal specific differences but with the information available it seems best to place it here.

Collected at Pango Pango, Samoa.

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EXPLANATION OF PLATES

PLATE 1

FIGS. 1– 3.—*Notopygos andrewsi* Monro. Fig. 1, anterior end × 4; fig. 2, parapodium × 4; fig. 3 seta × 35.

4– 8.—*Thormora trissochaeta* Grube. Fig. 4, anterior end × 20 fig. 5, elytron × 15; fig. 6, parapodium × 20; fig. 7, dorsal seta × 250; fig. 8, ventral seta × 250.

9–13.—*Halosydna oculata* Treadwell. Fig. 9, anterior end × 10; fig. 10, elytron × 10; fig. 11, parapodium × 25; smooth seta × 250; fig. 13, toothed seta × 250.

PLATE 2

FIGS. 14–18.—*Harmothoe villosa* Treadwell. Fig. 14, anterior end × 15; fig. 15, parapodium × 23; fig. 16, toothed seta × 250; fig. 17, second form of seta × 135; fig. 18, elytron × 45.

19–21.—*Phyllodoce pulla* Treadwell. Fig. 19, anterior end × 10; fig. 20, parapodium × 28; fig. 21, seta × 250.

22–24.—*Phyllodoce violacea* Treadwell. Fig. 22, anterior end × 10, fig. 23, parapodium × 28; fig. 24, seta × 250.

25–27.—*Phyllodoce fusca-cirrata* Treadwell. Fig. 25, anterior end × 7.5; fig. 26, parapodium × 12; fig. 27, seta × 250.

28–30.—*Euratio punctata* Treadwell. Fig. 28, showing collar, tentacles and mouth lobes × 5; fig. 29, seta × 250; fig. 30, uncinus × 250.

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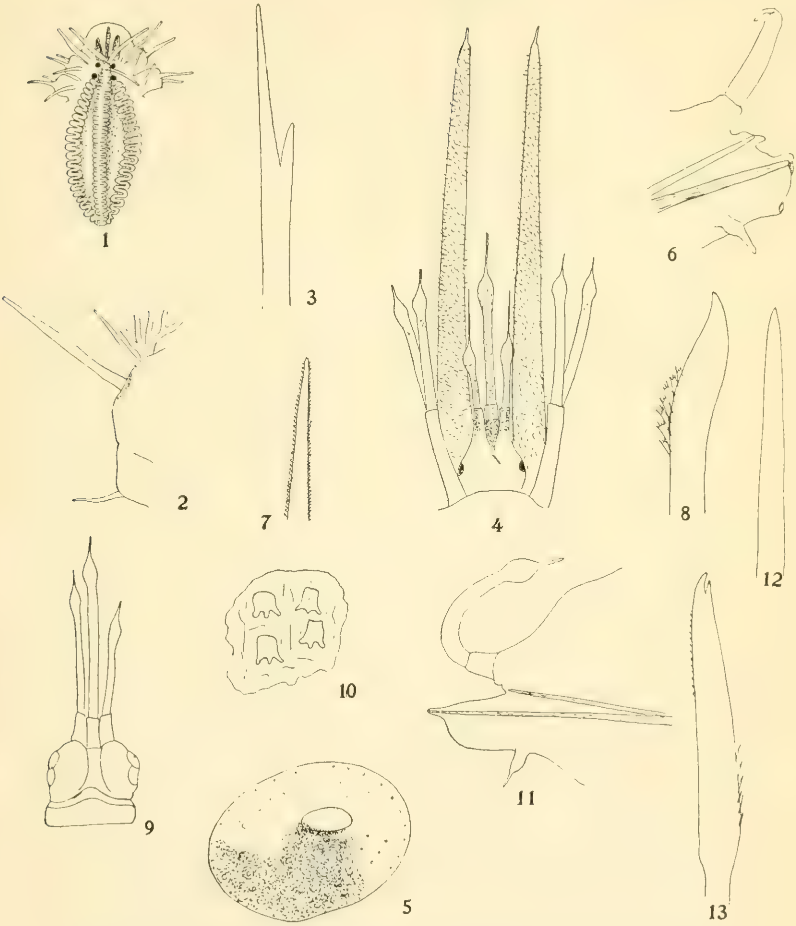
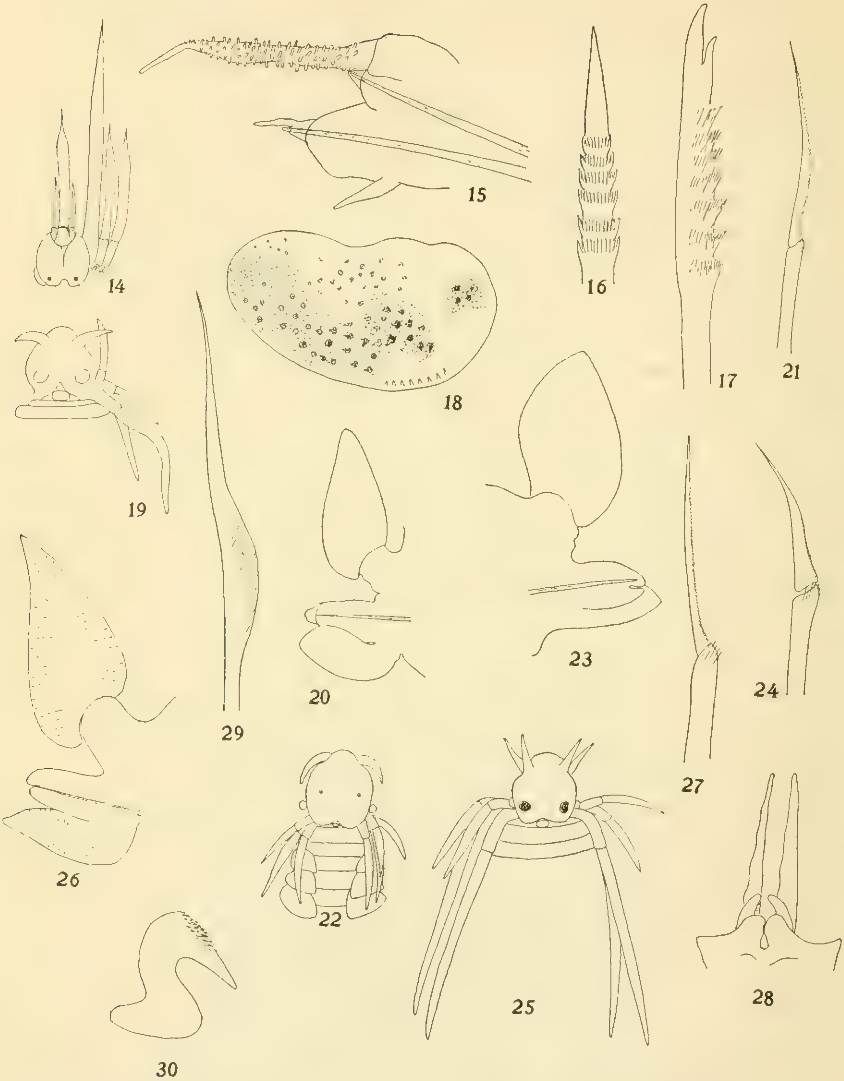


POLYCHAETOUS ANNELIDS FROM FIJI, SAMOA, CHINA, AND JAPAN

FOR EXPLANATION OF PLATE SEE PAGE 20



POLYCHAETOUS ANNELIDS FROM FIJI, SAMOA, CHINA, AND JAPAN

FOR EXPLANATION OF PLATE SEE PAGE 20

A REVISION OF THE PARASITIC WASPS OF THE SUBFAMILY BRACONINAE OCCURRING IN AMERICA NORTH OF MEXICO

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INTRODUCTION

It was shown by Viereck[1] that *Cremnops* Foerster (1862), a genus of Agathidinae, is isogenotypic with *Bracon* Fabricius (1804), and must therefore be suppressed as a synonym. Since, under the rules of nomenclature, one of the subfamily names must be based on the same generic name as that on which the name of the family is founded, it became necessary to replace Agathidinae of Authors with the subfamily name Braconinae. This change has been published by Gahan.[2]

The following pages present the results of a detailed study of the Braconinae of America north of Mexico, with the purpose of facilitating the identification of the species occurring in this region. The Nearctic species of the genus *Bracon* Fabricius (*Cremnops* Foerster) have been comparatively recently studied and classified by Morrison,[3] and a treatment of *Bracon* therefore will be omitted from this paper, except for the description of a single new species. There are many world genera that have been assigned to this subfamily which are not known to occur in our fauna. These have been omitted from even the generic key, because it is impossible to determine what most of them are without access to the genotypes, and their inclusion would almost certainly increase the difficulty of recognizing our known genera in the key.

The collection of Braconinae in the United States National Museum has served as a basis for this revision. In addition, I have had the opportunity of studying the types in the Philadelphia Academy of Science, those in the University of Kansas, and those at the State agricultural experiment station in New Haven, Connecticut. I have also seen certain material from the collections of the University of Illinois and the Boston Society of Natural History.

[1] Bull. 83, U. S. Nat. Mus., 1914, pp. 23 and 37.
[2] Proc. U. S. Nat. Mus., vol. 53, 1917, p. 197.
[3] Idem, vol. 52, 1917, pp. 305–343.

No. 2642.—Proceedings U. S. National Museum, Vol. 69. Art. 16.

3015—27——1

This paper is a contribution from the division of gipsy moth and brown-tail moth investigations of the Bureau of Entomology. I am indebted to A. F. Burgess, in charge of this division for making the study possible. At this point I also wish to express my thanks to Dr. Henry Skinner, of the Philadelphia Academy of Science, Dr. W. E. Britton, of the Connecticut Agricultural Experiment Station, and Dr. H. B. Hungerford, of the University of Kansas, for permission to examine types in their custody, and to Dr. T. H Frison, of the University of Illinois, and C. W. Johnson, of the Boston Society of Natural History, for the loan of specimens. S. A. Rohwer and A. B. Gahan, of the division of taxonomic investigations, United States Bureau of Entomology, have allowed me the use of certain of their notes and have contributed many valuable suggestions.

CLASSIFICATION

Superfamily ICHNEUMONOIDEA

Family BRACONIDAE

Subfamily BRACONINAE

Agathidoidae FOERSTER, Verh. naturh. Ver. preuss. Rheinl., vol. 19, 1862, pp 228 and 245.

Eumicrodoidae FOERSTER, Verh. naturh. Ver. preuss. Rheinl., vol. 19, 1862, pp. 228 and 246.

Agathidides MARSHALL, Trans. Ent. Soc. London, 1885, pp. 10 and 261.

Agathidinae CRESSON, Syn. Hymen. N. Amer., 1887, pp. 55 and 59.

Agathidinae, ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 127.

Agathinae SZEPLIGETI, Genera Insectorum, fasc. 22, 1904, p. 115.

Foerster made two distinct families of this group, basing his division solely upon the shape of the head. Marshall, however, considered Foerster's Agathidoidae and Eumicrodoidae so essentially similar that he combined them under the name "Agathidides." Ashmead, although appreciating the extremely close relationship between the two families, nevertheless held them distinct as the tribes Agathidini and Microdini, respectively, of his subfamily Agathidinae. A little later Szepligeti again combined these in a single group which he called the Agathinae. In my opinion it is altogether impossible to divide the subfamily on the basis of the shape of the head. In fact, the study of a large quantity of material has compelled me to synonymize *Agathis* Latreille, which is representative of Foerster's Agathidoidae, with *Bassus* Fabricius (= *Microdus* Nees), the typical genus of his Eumicrodoidae. This will be discussed in more detail in the treatment of the genus *Bassus*.

Because of certain superficial resemblances Foerster placed *Orgilus* Haliday in his Eumicrodoidae. On the basis of its margined occiput Ashmead removed the genus to the Blacinae; but Szepligeti still

later followed Foerster and Marshall and placed it in his Agathinae. Even more recently Lyle[4] has retained *Orgilus* in this group. The margined or immargined condition of the occiput is one of the most dependable subfamily characters in the Braconidae, and the margined occiput of *Orgilus*, combined with the open second cubital cell and the broader radial cell, seems to me to necessitate the exclusion of the genus from this subfamily. Accordingly, it is omitted from the Braconinae as treated in this paper. Szepligeti also incorrectly included *Plumarius* Phillippi and *Neoneurus* Haliday. The former of these has been shown by Bradley[5] to belong in the Mutillidae; and Bengtsson[6] has properly established the subfamily Neoneurinae for the reception of *Neoneurus* and *Elasmosoma* Ruthe. *Meteoridea*

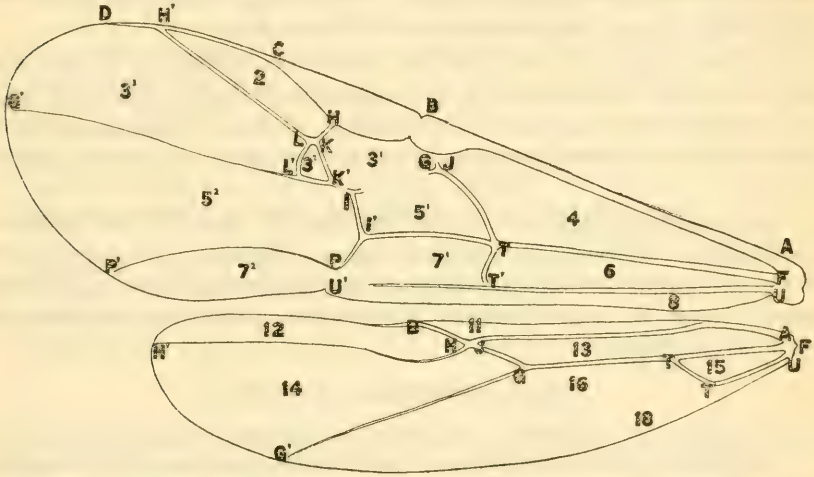

FIG. 1.—WINGS OF BASSUS SANCTUS SAY.

VEINS.—ANTERIOR WING: AB=COSTA; BC=STIGMA; CH'D=METACARPUS; HKH'=RADIUS; GK'G'=CUBITUS FT=MEDIUS; TI'P=DISCOIDEUS; PP'=SUBDISCOIDEUS; UT'=SUBMEDIUS; T'U'=BRACHIUS; JT=BASAL VEIN; KK'=1ST INTERCUBITUS; LL'=2D INTERCUBITUS; II'=RECURRENT VEIN; TT'=NERVULUS.

POSTERIOR WING: AJB=SUBCOSTELLA; HH'=RADIELLA; GG'=CUBITELLA; FT=1ST ABSCISSA OF MEDIELLA; TG=2D ABSCISSA OF MEDIELLA; UT'=SUBMEDIELLA; JG=BASELLA; TT'=NERVELLUS.

CELLS.—2=RADIAL CELL; 3=CUBITAL CELLS; 4=MEDIAN CELL; 5=DISCOIDAL CELLS; 6=SUBMEDIAN CELL; 7=BRACHIAL CELLS; 8=ANAL CELL; 11=COSTELLAN CELL; 12=RADIELLAN CELL; 13=MEDIELLAN CELL; 14=CUBITELLAN CELL; 15=SUBMEDIELLAN CELL; 16=DISCOIDELLAN CELL; 18=BRACHIELLAN CELL.

Ashmead was placed by its author in his Agathidinae, but it clearly does not belong there, being evidently a Diospiline.

The following combination of characters will distinguish members of the Braconinae: Head transverse; face sometimes much lengthened; eyes bare or practically so; maxillary palpi five-segmented; labial palpi usually four-segmented; no opening between clypeus and

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[4] The Entomologist, vol. 53, 1920, p. 177.

[5] Journ. Wash. Acad. Sci., vol. 11, 1921, p. 214.

[6] Lund. Univ. Arsskr., n. f., Avd. 2, vol. 14, 1918, p. 1.

mandibles; the labrum nearly always conspicuous and filling the space between clypeus and mandibles; labium sometimes extented; occiput immargined; parapsidal furrows usually, though not always, impressed; prepectal carina usually very distinct; first cubital and first discoidal cells nearly always confluent (in the Nearctic forms separated only in *Earinus*); radial cell always exceptionally narrow and ending far before apex of wing, always complete; the radius strong and distinct to the wing margin; second cubital cell small, triangular, subtriangular or subquadrate, sessile or petiolate complete, both intercubiti being present; mediella straight, the second abscissa on a line with the first; submediellan cell varying in length; abdomen usually sessile, rarely subpetiolate; ovipositor varying from not exserted to longer than the body. The wing characters alone will practically always indicate species of Braconinae.

In order to prevent any possible misunderstanding with regard to the terms used in designating wing characters in the following keys and descriptions, a detailed explanation of wing veins and cells is given below the accompanying figure of the wings of *Bassus sanctus* Say.

Comparatively little is known regarding the specific host relationships of the various species of Braconinae. Most of the species, however, are undoubtedly parasitic on lepidopterous larvae, although some appear to attack certain coleopterous borers in the stems of herbaceous plants.

KEY TO THE NEARCTIC GENERA OF BRACONINAE

1. First cubital cell completely separated from the first discoidal; second cubital cell quadrate or subquadrate, broadly sessile; parapsidal furrows wanting; tarsal claws with a large basal tooth; ovipositor sheaths unusually broad and densely hairy__________ Earinus Wesmael.
   First cubital cell confluent with the first discoidal__________ 2.
2. Tarsal claws, at least those of the anterior legs, distinctly cleft; second cubital cell quadrate or subquadrate sessile; the second abscissa of radius usually much longer than the first—if not, then the apical segment of posterior trochanters strongly carinately margined beneath on the outer side; frons margined laterally by a distinct carina or ridge; propodeum coarsely aerolated; abdomen always completely polished__________ 3.
   Tarsal claws simple or with a broad basal tooth, never cleft; areolet usually triangular or subtriangular, the second abscissa of radius rarely distinct and then very short; apical segment of posterior trochanters never carinate beneath; frons usually immargined; sculpture of propodeum and abdomen variable__________ 4.
3. Face not rostriform; the eyes unusualy large, the malar space very short, rarely one-fourth as long as the eyes; apical segment of posterior trochanters distinctly carinately margined beneath on the outer side; inner spur of hind tibia much more than half as long as the posterior basitarsus; scutellum distinctly margined at apex; scape of antennae unusually large and much longer than the first flagellar segment; ovipositor sheaths shorter than the first abdominal tergite__________ Zelomorpha Ashmead.

Face elongate; rostriform; the malar space varying from a little shorter to a little longer than the eyes; apical segment of posterior trochanters not carinately margined beneath; tibial spurs shorter; scutellum not margined at apex; ovipositor sheaths about as long as the abdomen or nearly.
Bracon Fabricius.

4. Maxillary palpi modified to form a long 5-segmented hollow beak that is usually as long as the head and thorax combined; tarsal claws simple, or with an indistinct basal tooth; basal abdominal tergites sculptured; ovipositor long ---------- **Aenigmostomus** Ashmead.

Maxillary palpi normal, not modified to form a long beak ---------- 5.

5. Posterior basitarsus more or less incrassate, sometimes very broad; apical segment of all tarsi very large and long; the apical segment of hind tarsi usually fully as long as the second segment; tarsal claws large and with a distinct basal tooth; labium usually conspicously extended; wings varying from yellow to practically hyaline, with the area covered by the third cubital, second discoidal, and second brachial cells, contrastingly dusky; propodeum short and broad, fully twice as broad as long down the middle; ovipositor sheaths varying from as long as the first abdominal tergite to as long as the abdomen ---------- **Agathirsia** Westwood.

Posterior basitarsus not incrassate; otherwise not combining the above characters ---------- 6.

6. Ovipositor barely exserted and strongly decurved; tarsal claws large, simple, with no indication of a basal tooth; abdomen completely polished with no suggestion of sculpture; propodeum closely rugose, not areolated.
Crassomicrodus Ashmead.

Ovipositor always prominent, the sheaths at least as long as the abdomen; tarsal claws with a basal tooth, which is usually very pronounced, very rarely without a distinct basal tooth (*brevicornis*), but then the abdomen more or less sculptured at base and the propodeum not closely rugose.
Bassus Fabricius.

Genus EARINUS Wesmael

Earinus WESMAEL, Nouv. Mem. Acad. Sci. Brux., vol. 10, 1837, p. 8. *Genotype.*—(*Microdus gloriator* Nees) = *Bassus gloriatorius* Panzer (Monobasic).

Diatmetus FOERSTER, Verh. naturh. Ver. preuss. Rheinl., vol. 19, 1862, p. 246. *Genotype.*—(*Microdus gloriator* Nees) = *Bassus gloriatorius* Panzer (Monobasic). Isogenotypic with *Earinus* Wesmael.

The most conspicuous difference between this genus and all other genera of the Braconinae which are represented in the Nearctic fauna, is the complete separation of the first cubital and first discoidal cells. But, in addition to this, *Earinus* exhibits a combination of characters not found in the genus *Bassus*, to which it is most closely allied.

Head transverse, somewhat hollowed out behind; face not rostriform, much broader than long from the antennal foramina to the apex of clypeus, with long abundant whitish pile; clypeus broad; mandibles large, crossing at tips, bidentate, the inner tooth much shorter than the outer and truncate; palpi normal, the maxillary palpi 5-segmented, the labial 4-segmented; labium not extended; eyes large, malar space much less than half the eye height; frontal impressions not margined by carinae; all three ocelli situated on the vertex, the median ocellus not distinctly below the others; parapsidal

furrows wanting; mesopleural furrow represented by a shallow polished impression; propodeum rounded; its entire apical margin sharply carinate and conspicuously elevated; propodeal spiracles small, nearly circular; wings hyaline; first cubital and first discoidal cells completely separated; second cubital cell quadrate, the second abscissa of radius always distinct and usually longer than the first; legs moderately long; inner spur of hind tibiae a little less than half the metatarsus; tarsal claws with a tooth at base; abdomen broadly sessile, depressed, rather slender, the middle segments only slightly widened; ovipositor prominent; the sheaths exceptionally broad, and densely hairy.

Only one species has been found in our fauna.

EARINUS LIMITARIS (Say)

Bassus limitaris Say, Boston Journ. Nat. Hist., vol. 1, p. 250.
Earinus limitaris Cresson, Canad. Ent., vol. 5, 1873, p. 54.

Type.—Lost.

The following characters added to the foregoing generic description will distinguish this species: Face usually rather evenly punctate, slightly elevated down the median line; temples moderately broad but receding; cheeks bulging a little; ocell-ocular line not or only slightly longer than twice the diameter of an ocellus and hardly as long as postocellar line; the ocellar area a little elevated above the rest of the vertex; antennae usually 35 to 40 segmented, the flagellum tapering somewhat to the apex; all the segments longer than broad; mesoscutum weakly punctate; propodeum mostly smooth, usually with two more or less distinct median carinae that diverge slightly behind; pleura and propodeum covered with abundant, long, grayish pile; radius usually arising distinctly before middle of stigma, but varying somewhat in this respect, occasionally coming from the middle of stigma; second cubital cell usually about as long as high, with the second abscissa of radius longer than the first and the second intercubitus angled outwardly; but there is considerable variation in this, the second abscissa of radius being sometimes no longer than the first and the second intercubitus not always angled; nervulus interstitial with basal vein, or nearly; first abscissa of mediella longer than the second; nervellus angled and emitting a distinct discoidella; anterior femora somewhat swollen; posterior femora, tibiae, and tarsi rather long and slender; abdomen flat above, nearly parallel-sided, narrowed only a little basally and apically; first tergite slightly roughened, usually with two prominent dorsal keels that converge slightly behind; ovipositor sheaths very broad, strongly hairy and about as long as the abdomen. Body entirely black; wings hyaline or very faintly dusky; legs, including coxae, testaceous; the anterior coxae sometimes blackish at base; the posterior tibiae usually yellow-

ish white, with a small, often incomplete, blackish annulus a short distance from the base and with nearly the apical half black; the color of the posterior tibiae varies somewhat, however; sometimes the broad apical band is red on the inner surface, and, very rarely, the hind tibiae are entirely reddish apically and lack a distinct blackish spot or band near the base; all intergrades occur; posterior tarsi blackish.

There is a considerable number of specimens of this species in the United States National Museum from various localities in New York, Ohio, Michigan, Maryland, Virginia, New Hampshire, Colorado, Nevada, California, and Canada. I have also seen several specimens from Illinois in the collection of the University of Illinois.

The host relationships of the species are not known.

Genus ZELOMORPHA Ashmead

Neophylax ASHMEAD (not McLachlan), Proc. U. S. Nat. Mus., vol. 23, 1900, p. 119. *Genotype.—Neophylax snyderi* Ashmead (Monobasic).

Zelomorpha Ashmead, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 126. *Genotype.—Zelomorpha arizonensis* Ashmead (Monobasic).

Caenophylax SCHULZ (=*Neophylax* Ashmead preoccupied), Zool. Ann., 1911, p. 88.

Zelomorphidea VIERECK, Proc. U. S. Nat. Mus., vol. 42, 1912, p. 630. *Genotype.—Zelomorpha (Zelomorphidea) melanota* Viereck (Monobasic).

Neophylax Ashmead has page precedence over *Zelomorpha*, but, as has been shown by Schulz, it is preoccupied by *Neophylax* McLachan (1871). Schulz proposed *Caenophylax* for *Neophylax* Ashmead, but this name is unnecessary since *Zelomorpha*, a synonym of *Neophylax* Ashmead, is available. In his list of the genotypes of the Ichneumonoidea[7] Viereck synonymized *Neophylax* with *Euagathis* Szepligeti, apparently, however, without having seen the genotype of the latter. If this synonymy is correct *Zelomorpha* must be suppressed as a synonym of *Euagathis*, which has priority. But, although the two genera seem to be closely related, certain characters, particularly the immargined frons and the completely margined scutellum, which Szepligeti originally ascribed to *Euagathis*, do not hold for *Zelomorpha*, and some of the most striking characters of the latter genus, the carinately margined apical segment of the posterior trochanters, the large eyes, and the exceptionally long tibial spurs, are not mentioned by Szepligeti for *Euagathis*. Consequently I think it unwise to accept Viereck's synonymy without first seeing the genotype of *Euagathis*, and I shall therefore retain *Zelomorpha* as a good genus.

The following characters apply to this genus as it is known at present: Head transverse, about as broad as long, not at all rostriform; palpi slender, the maxillary palpi 5-segmented, the labial 4-seg-

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[7] Bull. 83, U. S. Nat. Mus., 1914, p. 100.

mented; eyes very large and prominent, the malar space short; temples unusually narrow and strongly receding; two more or less prominent elevations between antennae; frons margined by carinae; ocelli very large; antennae rather long, the scape exceptionally large, much longer than the first flagellar segment; parapsidal furrows impressed; scutellum margined at apex; propodeum areolated; propodeal spiracles large, slitlike; apical segment of the posterior trochanters carinately margined beneath on the outer side; tibial spurs very long; tarsi slender, the apical segment of all tarsi long; the claws cleft; first cubital and first discoidal cells confluent; second cubital cell small, subquadrate, narrowed above; the second intercubitus angled outwardly; radiellan cell narrower than usual; submediellan cell very short; abdomen narrow, somewhat compressed apically in the female, entirely polished; ovipositor sheaths shorter than the first abdominal tergite. Color usually ferruginous.

Only a single species of this interesting genus occurs in our fauna.

ZELOMORPHA ARIZONENSIS Ashmead

Zelomorpha arizonensis Ashmead, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 129.

Since Ashmead did not describe this species, except as it was characterized in his generic key, a rather full description is given here.

Length usually 7–8 mm.; head strongly transverse; face smooth, temples and cheeks very narrow; eyes very large, weakly emarginate opposite the insertion of antennae; malar space very short; scarcely as long as the basal width of mandibles; palpi normal; frons rather sharply margined laterally; ocelli especially large, the ocell-ocular line distinctly shorter than the diameter of a lateral ocellus; antennae usually 40 to 45 segmented, tapering to the tip; scape very large, subcylindrical, obliquely truncate at apex, much longer than the first flagellar segment; pedicel transverse, very short; thorax moderately stout; parapsidal furrows impressed, but the mesonotal lobes not very prominent; the middle lobe shallowly impressed medially; furrow in front of scutellum broad, deep, and usually with several distinctly separated pits; scutellum slightly convex, broadly truncate at apex, where it is margined by a distinct carina; propodeum short, rather gradually declivous, with about twelve sharply delimited areas that are smooth within; usually five distinctly separated areas behind the prominent apical transverse carina; propodeal spiracles large, rather slitlike; pleura polished; mesopleural furrow smooth or weakly foveolate; posterior coxae rather long, punctate; femora, tibiae, and tarsi rather slender; apical segment of hind trochanters sharply carinately margined below; inner spur of middle tibia about as long as the middle basitarsus; inner spur of hind tibia much longer than the outer and also much longer than

half the posterior basitarsus; apical segment of hind tarsi about as long as the second tarsal segment; claws distinctly cleft; radius arising from a little before middle of stigma; radial cell rather long, but very narrow; second cubital cell subquadrate, narrowed above; the second intercubitus usually strongly angled outwardly; medius obsolescent basally; nervulus usually a little antefurcal; submediellan cell very short, the first abscissa of mediella much shorter than the second; abdomen not longer than head and thorax combined, rather narrow, somewhat compressed apically, entirely polished; ovipositor sheaths distinctly exserted, but considerably shorter than the first abdominal tergite. Color, uniformly ferruginous; antennae blackish; legs concolorous with the body, the posterior tarsi more or less dusky; wings hyaline.

The above description is based on the following material, which is in the United States National Museum: One specimen from Arizona labeled "Type No. 16221"; 4 specimens from Laredo, Texas; 1 from Brownsville, Texas (C. H. T. Townsend); and 1 from Florence, Arizona (C. B. Biederman).

Genus BRACON Fabricius

Bracon FABRICIUS, Syst. Piez., 1804, p. 102. *Genotype.—Ichneumon desertor* Linnaeus (By designation of Curtis, Brit. Ent., 1825, No. 69).

Cremnops FOERSTER, Verh. naturh. Ver. preuss. Rheinl., vol. 19, 1862, p. 246. *Genotype.*—[*Agathis deflagrator* Nees (Monobasic)]=*Cremnops desertor* (Linnaeus).

This genus has been discussed in detail by Morrison,[8] who has included in his paper a revision of the Neartic species. It is therefore unnecessary to consider the group here further than to describe a single species which was not included by Morrison.

BRACON CRASSIFEMUR, new species

At once distinguished by the broad posterior femora. In Morrison's key it falls nearest *vulgaris* (Cresson), because the antennal scape is produced into a distinct tooth in front; but it can be easily separated from *vulgaris* by the more robust form, the unusually broad posterior femora, and the entirely black head and mesopleura.

Male.—Length, 9 mm.; face long, rostriform; malar space fully as long as the eye; face slightly impressed medially below the antennae; frontal impression unusually strongly margined laterally; frons and vertex polished; the lateral ocelli separated by a prominent polished elevation; ocell-ocular line fully twice the diameter of a lateral ocellus; antennae of type 45-segmented, of paratype 43-segmented; apex of antennal scape produced into a conspicuous tooth inwardly in front, this tooth more strongly developed than is usually true of *vulgaris;* pronotal pits large and deep, distinctly separated; parapsidal furrows

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[8] Proc. U. S. Nat. Mus., vol. 52, 1917, pp. 305–343.

impressed, smooth; the middle mesonotal lobe shallowly impressed down the middle; fossa in front of scutellum very broad and deep, entirely polished, and with a median carina bisecting it; scutellum polished; propodeum aerolated, shining; the median area long and narrow, acute at base; posterior face of propodeum abruptly declivous, separated from the dorsal face by a sharp transverse carina; pleura polished; mesopleural furrow shallow, not foveolate; posterior femora short and unusually broad; posterior tibiae stouter than usual, sloping off rather strongly on the outer side of the apex, above the terminal spurs, and here provided with an exceptionally large number of conspicuous short stout spines, there being more than forty of these spines on each hind tibia; inner spur of posterior tibiae much longer than the outer and nearly half as long as the basitarsus; apical segment of posterior tarsi stout and about as long as the second tarsal segment; claws cleft; wing venation essentially as in *vulgaris;* abdomen as long as head and thorax, narrower than the thorax, entirely smooth and polished. Head entirely black; antennae and palpi black; thorax dark ferruginous, with the venter, the prothorax except more or less of the propleura, the mesopleura entirely, and the middle mesonotal lobe anteriorly black; wings strongly infumated; anterior and middle legs wholly black; posterior legs red, their trochanters and tarsi black; abdomen entirely red.

Type.—In the collection of the University of Illinois.

Type locality.—Baboquivari Mountains, Pima Company, Arizona.

Described from two male specimens collected July 27–31, 1923, by O. C. Poling. Through the kindness of Dr. T. H. Frison, curator of the insect collection at the University of Illinois, the paratype, which is practically a duplicate of the type, has been deposited in the United States National Museum, and has been given Catalogue No. 28689.

Genus AENIGMOSTOMUS Ashmead

Aenigmostomus Ashmead, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 128. *Genotype.—Microdus longipalpus* Cresson (Monobasic).

This genus is based upon the remarkable form of the maxillary palpi, which are modified to form a 5-segmented hollow beak that it usually about as long as the head and thorax. This character alone will separate the group from all other genera in the Braconinae.

Head transverse, strongly hollowed out behind; eyes moderately large; malar space less than half the length of eyes; face rather narrow, but about as broad as long from antennal foramina to apex of clypeus; labial palpi very slender; mandibles short, the tips not quite meeting, bidentate, the teeth short; labrum large; clypeus long, convex, only a little broader than long; frontal impressions not margined by carinae; antennae slender; thorax long and narrow; parapsidal furrows finely impressed, usually not distinct anteriorly; scu-

tellum not margined at apex; mesopleural furrow finely foveolate; prepectal carina wanting; propodeum rugulose, with two slightly diverging median carinae; wings as in *Bassus;* first cubital and first discoidal cells confluent; second cubital cell triangular, sessile; spurs of hind tibia less than half the length of basitarsus; several short stout spines at apex of posterior tibiae above the outer terminal spur; tarsal claws simple, or with an indistinct basal tooth; abdomen slender, rather broadly sessile, the basal tergites more or less sculptured; hypopygium moderate, not surpassing apex of last dorsal segment; ovipositor long.

This genus is represented by a single known species.

AENIGMOSTOMUS LONGIPALPUS (Cresson)

Microdus? longipalpus Cresson, Proc. Ent. Soc. Phila., vol. 4, 1865, p. 299.
Aenigmostomus longipalpus Ashmead, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 128.

Type.—No. 2745, Academy of Natural Sciences, Philadelphia, Pennsylvania.

The following characters, combined with the above generic description, will identify this species: Temples rather broad, but sloping off gradually, not bulging; cheeks strongly receding; antennae usually 24 to 26 segmented, the flagellum slender, not tapering at all to the apex; ocell-ocular line distinctly less than twice the diameter of an ocellus and scarcely as long as the postocellar line; no tubercles between antennae; outer margins of antennal foramina very close to the eyes; mesoscutum and scutellum polished, the latter flat; mesosternum fully as long as broad; propodeum finely rugulose, with two prominent median carinae which diverge slightly behind; the dorsal face of propodeum long and only very slightly declivous; propodeal spiracle very small, nearly circular; radius arising from about the middle of stigma; areolet triangular, sessile; first abscissa of mediella slightly longer than the second; nervellus angled and emitting the discoidella from this angle; posterior tibiae distinctly shorter than their tarsi; the terminal spurs of hind tibia of equal length and only about one-third as long as the posterior basitarsus; last segment of hind tarsi shorter than the third: first abdominal tergite scarcely longer than broad, impressed at base, with two widely separated dorsal longitudinal keels, and finely longitudinally rugulose; second tergite very finely sculptured and with a more or less distinct transverse impression just behind the middle; remainder of abdomen polished; ovipositor sheaths a little longer than the entire body. Head and thorax black; wings uniformly infuscated; legs, including all coxae, testaceous; all tarsi more or less dusky; abdomen yellow-ferruginous, the first tergite except at apex, and sometimes more or less of the apical segments, blackish.

In addition to the type, which is from Colorado, I have seen the following specimens, which are in the collection of the United States National Museum: One from Nebraska; 1 from Tifton, Georgia; 2 from southern Illinois (Robertson); 1 from Onaga, Kansas, and 5 from Riley County, Kansas (Marlatt).

Genus AGATHIRSIA Westwood

Agathirsia WESTWOOD, Tijdschr. v. Ent., vol. 25, 1882, p. 20. *Genotype.—Agathirsia rufula* Westwood (by designation of Viereck, Bull. 83, U. S. Nat. Mus., 1914, p. 6).

Agathona WESTWOOD, Tijdschr. v. Ent., vol. 25, 1882, p. 22. *Genotype.—Agathona sericans* Westwood (Monobasic).

Paragathis ASHMEAD, Proc. U. S. Nat. Mus., vol. 11, 1889 (1888), p. 638. *Genotype.—Microdus thoracicus* Cresson (Monobasic).

Agathirsia WESTWOOD=(*Paragathis* Ashmead), Ashmead, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 128.

Agathirsia WESTWOOD=(*Agathona* Westwood), Szepligeti, Gen. Ins., fasc. 22, 1904, p. 128.

I have not seen the genotype of *Agathona*, but judging by Westwood's description and figure it appears probable that Szepligeti was correct in synonymizing this genus with *Agathirsia*. That *Paragathis* Ashmead belongs here is very evident from a comparison of the genotype.

Head transverse, at least as broad as the thorax, rather strongly hollowed out behind; face much broader than long from antennal foramina to apex of clypeus; labium usually prominently extended; mandibles falcate, with a very short tooth within; maxillary palpi 5-segmented; labial palpi 4-segmented; frontal impressions immargined; no prominent elevations between antennae; vertex rather narrow; ocelli small; ocell-ocular line at least three times the diameter of an ocellus; temples rather broad, bulging somewhat; antennae of the female usually short, most of the flagellar segments stout; thorax stout; parapsidal furrows impressed, foveolate; furrow in front of scutellum broad, deep; mesopleural furrow foveolate; propodeum short and broad, more than twice as broad as long down the middle, rugose, not areolated; propodeal spiracle oval, rather prominent; coxae stout; posterior tibiae with numerous minute stout spines on the outer side at the apex; inner spur of posterior tibia distinctly less than half the metatarsus; posterior metatarsus more or less incrassate; apical tarsal segment large, long; tarsal claws with a distinct basal tooth; wings yellow to nearly hyaline on basal half or more, the area covered by the third cubital, second discoidal, and second brachial cells rather contrastingly dusky; second cubital cell subtriangular, usually petiolate; abdomen stout, completely polished with not even a suggestion of sculpture; first tergite without dorsal

keels or elevations; hypopygium large, but not surpassing the apex of last dorsal abdominal segment; ovipositor sheaths not longer than the abdomen.

The host relationships of none of our species are known.

KEY TO THE THREE KNOWN NEARCTIC SPECIES OF AGATHIRSIA

1. Head and thorax testaceous, with only the prepectus and coxal cavities sometimes black; malar space more than half as long as the eye-height; posterior margin of mesosternum with a distinct backwardly-projecting lobe on either side of the mesosulcus; posterior metatarsus only slightly incrassate; face and propodeum with short scattered pubescence; ovipositor sheaths about as long as the abdomen………………… 1. **testacea**, new species.
   Head black; thorax except mesonotum and part of propleura, black; malar space not more than half as long as the eyes; posterior margin of mesosternum without a distinct lobe either side of the mesosulcus; posterior metatarsus more strongly incrassate; face and propodeum with long sericeous pile; ovipositor sheaths distinctly shorter than the abdomen…… 2.
2. Legs testaceous, with the anterior and middle coxae, and sometimes the posterior coxae, black; abdomen ferruginous on the basal half, completely black on the apical half………………………… 2. **nigricauda** (Viereck).
   All coxae and trochanters, the posterior femora and more or less of the anterior and middle femora, black; abdomen yellowish-ferruginous, varied with black; first abdominal tergite yellowish with a large black spot on apical half; extreme apex of abdomen above, ferruginous.
   3. **thoracica** (Cresson).

1. **AGATHIRSIA TESTACEA**, new species

Female.—Length 8 mm. Head transverse; temples bulging somewhat, but not broad; face much broader than long, slightly convex, punctate; clypeus large, broader at apex than distance from antennal foramina to clypeus: labrum large; labium only slightly extended; malar space longer than half the eye height and longer than the first segment of antennal flagellum; eyes long oval; ocell-ocular line nearly four times the diameter of an ocellus; antennae stout, short, 27-segmented in type, none of the flagellar segments beyond the first twice as long as broad, the segments of the apical third of flagellum mostly broader than long; parapsidal furrows impressed, finely foveolate; middle mesonotal lobe with a low median longitudinal elevation; the lobes only slightly convex; furrow in front of scutellum broad, deep, divided into several large pits; scutellum rather large, convex; propleura mostly ruguloso-punctate; mesopleural furrow coarsely foveolate; propodeum more than twice as broad as long, coarsely rugose; metapleura mostly ruguloso-punctate; posterior margin of mesosternum with a distinct backwardly projecting lobe on either side of the mesosulcus; posterior coxae stout, punctate; posterior tibiae thickened at apex and with some rather indistinct,

small, stout spines just above apex on the outer side; posterior metatarsus a little incrassate; radius arising from about the middle of stigma; areolet subtriangular, rather large, subpetiolate, slightly oblique; abdomen stout, about as long as the thorax, completely polished; first tergite about as broad at apex as long, without dorsal keels or other elevations; ovipositor sheaths about as long as the abdomen; ovipositor decurved at tip. Head, thorax, and abdomen ferrugino-testaceous; prepectus and coxal cavities usually black; antennae yellow on basal third, blackish beyond; legs concolorous with the body; wings hyaline on basal half, contrastingly dusky apically over an area comprised of the third cubital, second discoidal, and second brachial cells; abdomen sometimes more or less brownish apically.

Type.—Cat. No. 28693, U.S.N.M.

Type locality.—Mesilla, New Mexico.

Described from two female specimens collected by T. D. A. Cockerell. In the United States National Museum there are seven additional specimens, not included in the type series. These are from San Diego, Costulla, Brownsville, and Brewster County, Texas; and Las Cruces, New Mexico.

2. AGATHIRSIA NIGRICAUDA (Viereck)

Crassomicrodus nigricaudus VIERECK, Trans. Kans. Acad. Sci., vol. 19, 1905, p. 288.

Type.—In the University of Kansas collection.

Very similar to *thoracica,* but readily separated by the color characters given in the key. Thorax black except the upper margin of propleura and the mesoscutum, which are ferruginous; legs uniformly brownish yellow, with only the anterior and middle coxae and more or less of posterior coxae black; first, second, and basal half of third tergites ferruginous; remainder of abdomen entirely black; wings yellow, infuscated at apex, the infuscated area covering third cubital, second discoidal, and second brachial cells. Face with long sericeous pubescence, not convex, but rather weakly broadly impressed on either side of the middle line; malar space not half as long as the eye and hardly as long as second flagellar segment; antennae usually 30 to 33 segmented; temples and cheeks broad, swollen; propodeum coarsely rugose and provided with long sericeous pile; inner spur of hind tibia less than half the basitarsus. Posterior basitarsus incrassate, but not as broad as in *thoracica;* ovipositor sheaths a little longer than in that species, and somewhat shorter than in *testacea,* about as long as the abdomen beyond first segment.

The United States National Museum has four specimens of this species which are from Colorado and New Mexico.

3. AGATHIRSIA THORACICA (Cresson)

Microdus thoracicus CRESSON, Trans. Amer. Ent. Soc., vol. 4, 1872, p. 181.
Paragathis thoracicus ASHMEAD, Proc. U. S. Nat. Mus., vol. 11, 1889 (1888), p. 638.

Type.—The type of this species is in the Academy of Natural Sciences at Philadelphia, Pennsylvania; paratypes are in the United States National Museum.

Readily disinguished by the characters given in the key to species. Face closely punctate, pilose, not convex, somewhat impressed either side of the median line: malar space considerably less than half the length of the eyes; temples broad, bulging; antennae usually 29 to 31 segmented, the female antennae with most of the 15 apical segments broader than long; parapsidal furrows deeply impressed; the middle mesonotal lobe rather flat, with a low polished median longitudinal elevated line; scutellum short and very broad, propodeum rugose, with long, abundant, sericeous pile; posterior tibiae with numerous short, stout spines on the outer side at apex; posterior basitarsus strongly incrassate; last segment of hind tarsi about as long as the second; first abdominal tergite usually slightly longer than broad at apex, the apical half convex, with a faint median longitudinal impression; ovipositor sheaths not, or only a little, longer than first abdominal segment. Head black; female antennae bright orange yellow, with a little more than the apical third black; thorax black, with only upper half of propleura and the mesoscutum yellow-ferruginous; the first abdominal tergite testaceous with a large black spot apically; remainder of abdomen more or less varied with blackish, but the apical segments above always ferruginous; all coxae and trochanters black; the fore femora black at base and below; the middle femora usually mostly black, and the posterior femora black except narrowly at apex; tibiae and tarsi bright yellow; wings yellow, with the third cubital, the second discoidal, and second brachial cells infuscated.

In addition to four paratypes the National Museum has nine specimens, likewise collected in Texas.

Genus CRASSOMICRODUS Ashmead

Crassomicrodus ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 128. *Genotype.*—*Microdus fulvescens* Cresson (Monobasic).
Epimicrodus ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 129. *Genotype.*—*Microdus diversus* [sic]=*divisus* Cression (Monobasic).
Crassomicrodus Ashmead=(*Epimicrodus* Ashmead), BRADLEY, Psyche, vol. 23, 1916, pp. 139–140.

Bradley was correct in reducing *Epimicrodus* to synonymy under *Crassomicrodus.* The two genotypes, *Microdus fulvescens* Cresson and *Microdus divisus* Cresson, are unquestionably congeneric.

Head transverse, but frequently swollen behind the eyes, at least as broad as the thorax, and not distinctly rostriform; face much broader than long from antennal foramina to apex of clypeus; malar space usually half, or more than half, as long as the eye height; clypeus large, broad, convex, often a little elevated anteriorly; mandibles rather long, bidentate, the superior tooth long and acute, the inferior tooth very short; palpi normal, the maxillary palpi 5-segmented, the labial 4-segmented; frons smooth, the frontal impressions not margined by carinae; ocelli small, ocell-ocular line always much more than twice as long as the diameter of an ocellus; parapsidal furrows impressed; mesopleural furrow usually foveolate; propodeum sloping gradually from base to apex or slightly rounded, rugulose, not areolated; legs moderate; posterior tibiae without short stout spines outwardly at apex, above the outer terminal spur; inner spur of hind tibiae varying from a little shorter to much longer than half the basitarsus; tarsal claws simple, never cleft, nor with a basal tooth; wings dusky; radius arising at or beyond middle of stigma; second cubital cell small, subtriangular, oblique, petiolate; first cubital and first discoidal cells confluent; abdomen very narrow at extreme base, broad at the middle, completely polished, with not even a suggestion of sculpture; first tergite rather flat, slightly impressed at base, without dorsal longitudinal keels, narrow at base, strongly widened to the apex, where it is at least nearly as broad as long; hypopygium not prominent; ovipositor extremely short, the sheaths scarcely projecting beyond apex of abdomen. Head and thorax varying from testaceous to black; abdomen always testaceous or ferruginous, rarely black at extreme base.

KEY TO THE SPECIES OF CRASSOMICRODUS

Crassomicrodus? melanopleurus (Ashmead) is not included in this key. See page 22.

1. Head and thorax entirely black; first abdominal tergite black basally; all coxae and trochanters black; parapsidal grooves sharply impressed and finely foveolate; furrow in front of scutellum divided into 6 or more pits by distinct septa ---------- 1. **nigrithorax, new species.**

   At least the mesonotum testaceous ---------- 2.

2. Anterior wing hyaline at apex; propodeum straight, not rounded from base to apex; impression between lateral ocelli deep, weakly foveolate; inner spur of hind tibia longer than half the basitarsus ---------- 2. **apicipennis, new species.**

   Anterior wing not hyaline at apex; propodeum usually distinctly a little rounded from base to apex; impression between lateral ocelli usually shallow and smooth; length of inner spur of hind tibia variable ---------- 3.

3. Inner spur of posterior tibia not distinctly longer than half the basitarsus; last segment of hind tarsi much longer than the third, and nearly or quite as long as the second; cheeks and temples bulging prominently; cheeks, in front view, strongly rounded ---------- 4.

Inner spur of posterior tibia decidedly more than half the basitarsus; last segment of hind tarsi not or scarcely longer than the third and considerably shorter than the second; cheeks and temples not bulging so prominently; the cheeks, in front view, sloping rather evenly---------------5.

4. Head and thorax entirely testaceous, very rarely with propodeum more or less blackish; legs testaceous, except usually all the trochanters, the apex of posterior tibiae, and the posterior tarsi, which are generally blackish 3. **fulvescens** (Cresson).

Head black; thorax with pectus, meso- and meta-pleura, and propodeum mostly black; anterior and middle coxae, the posterior coxae usually and all trochanters black------------------------------4. **medius** (Cresson).

5. Head usually yellow, sometimes frons and vertex blackish, very rarely head entirely black; basal segment of posterior tarsi barely more than twice the second; first abdominal tergite only very slightly longer than propodeum; radial cell measured along wing margin not more than half as long as second abscissa of radius; length normally 4 to 5 mm--5. **pallens** (Cresson).

Head black, face occasionally reddish medially; basal segment of posterior tarsi much more than twice the second; first abdominal tergite much longer than propodeum; radial cell measured along wing margin distinctly more than half as long as second abscissa of radius; length normally 7 to 8 mm--6.

6. Anterior and middle legs black or blackish; meso- and meta-pleura, propodeum, and pectus nearly always mostly black; propleura more or less wrinkled anteriorly------------------------------6. **divisus** (Cresson).

Anterior and middle femora and tibiae testaceous; the black markings on thorax usually confined to the venter; propleura polished 7. **nigriceps** (Cresson).

1. CRASSOMICRODUS NIGRITHORAX, new species

Female.—Length 4 mm.; face more than twice as broad as long from antennal foramina to clypeus; clypeus large, prominent, its width at apex greater than the distance from antennal foramina to clypeus; face and clypeus smooth and polished, with long sparse pubescence; malar space a little longer than half the eye height; cheeks and temples broad, full, polished; the former somewhat rounded; eyes rather strongly convex, broadly oval, distinctly broader than the temples; frons smooth and polished; two low widely separated tubercles between antennae; ocell-ocular line at least three times the diameter of an ocellus; antennae 32-segmented in the type, nearly as long as the body; the scape large and stout; parapsidal furrows deeply impressed, finely foveolate; the mesonotal lobes and scutellum polished, the latter fully as long as broad; furrow in front of scutellum with about from six to eight distinct pits; pro- and meso-pleurae polished; meso-pleural furrow foveolate; propodeum sloping gradually from base to apex, not distinctly rounded, finely rugulose, with a small polished area medially at apex; metapleura mostly smooth, with scattered punctures; propodeal spiracle short oval; posterior coxae polished; inner spur of posterior tibia a little longer than half the metatarsus; last segment of hind tarsi some-

what longer than the third; areolet of fore wing small, triangular, oblique, petiolate; nervulus postfurcal; first abscissa of mediella about equal to the second; nervellus not angled; discoidella only weakly indicated; abdomen about as long as the thorax, entirely smooth and polished; first tergite broadening strongly toward apex, where it is about as broad as long; ovipositor barely exserted. Head and thorax entirely black; all coxae and trochanters black; all femora more or less black basally; middle tibiae blackish apically, hind tibiae black on apical half; wings infumated, the hyaline spots below stigma rather poorly defined; abdomen ferruginous, the first tergite black on basal half or more.

Male.—Essentially as in the female.

Type.—Cat. No. 28694, U.S.N.M.

Type locality.—Colorado.

Described from one female and one male labeled "Colo. 1329, C. F. Baker Collection."

2. CRASSOMICRODUS APICIPENNIS, new species

Very similar to *nigrithorax* in habitus, but differing particularly in having at least the mesonotum and propleura testaceous, and in the weaker parapsidal grooves. From *medius*, which it closely resembles in color, it differs in being considerably smaller and more compact, in the relatively longer spurs of posterior tibiae, and in the extreme apex of anterior wings being hyaline.

Female.—Length, 5 mm. Face at least twice as broad as long between antennal foramina and base of clypeus; clypeus shining, weakly punctate; malar space at least half as long as the eye height; eyes broadly oval, rather strongly convex, a little broader than the temples; temples and cheeks broad, bulging somewhat, smooth and polished; frons and vertex polished; antennae 33-segmented in the type, nearly as long as the body; all the flagellar segments longer than broad; two low rather widely separated tubercles between the antennae; ocell-ocular line nearly three times the diameter of an ocellus; a short rather deep, weakly foveolate groove between lateral ocelli; thorax compact parapsidal grooves present, but very shallow, weakly foveolate posteriorly; scutellum about as long as broad, polished; furrow in front of scutellum usually with four distinct pits; mesopleural furrow a little curved, foveolate; propodeum evenly declivous from base to apex, not rounded, rugulose; propodeal spiracle short oval; metapleura punctate, rugulose below; posterior coxae polished; inner spur of hind tibiae distinctly more than half as long as the basitarsus; last segment of hind tarsi somewhat longer than the third; areolet of fore wing small triangular, oblique, petiolate; stigma not three times as long as broad; radius arising only a little beyond middle of stigma; first abscissa of mediella about

as long as the second; nervellus not angled; abdomen short, about as long as the thorax, entirely polished; first tergite slightly longer than broad at apex, and at least two and one-half times as broad at apex as at base. Head entirely (except mandibles which are red), pectus, mesopleura, metapleura, propodeum, all coxae and trochanters, apex of posterior tibiae, and the posterior tarsi black; extreme apex of middle tibiae and their tarsi dusky; pronotum and propleura, mesoscutum, scutellum,and metanotum testaceous; abdomen ferruginous; wings infumated, the anterior pair more weakly so apically and completely hyaline along apical margin.

Male.—Antennae of allotype with 32 segments; otherwise as in the type.

Type.—Cat. No. 28695, U.S.N.M.

Type locality.—Mount Hood, Oregon.

Described from one male and one female. Undoubtedly additional specimens will exhibit more or less variation in the color of the thorax and legs. In the type one hind coxa is black while the other is red, suggesting the variability of these parts.

3. CRASSOMICRODUS FULVESCENS (Cresson)

Microdus fulvescens CRESSON, Proc. Ent. Soc. Phila., vol. 4, 1865, p. 297.
Crassomicrodus fulvescens ASHMEAD, Proc. U. S. Nat. Mus., vol. 23, 1900, p. 128.

Type.—No. 1727.1, Academy of Natural Sciences, Philadelphia, Pennsylvania.

This species can be distinguished especially by its uniformly honey-yellow color, its broad, strongly swollen cheeks and temples, and the relatively short inner spur of hind tibia, which is hardly half as long as the basitarsus. Rarely the propodeum is more or less blackish; the legs, including the coxae, are pale testaceous, with all trochanters usually, though not always, black; wings rather uniformly infumated with large hyaline spots in the first cubital and second discoidal cells; eyes not strongly convex, rather small; malar space more than half as long as the eye height; cheeks and temples as broad as the eyes; antennae usually 36 to 38 segmented; apical segment of posterior tarsi very slender, about as long as the second segment.

In addition to the type about 15 specimens have been examined, all of these being in the National Museum; they are from various localities in Colorado, Texas, Kansas, New Mexico, and Arizona.

4. CRASSOMICRODUS MEDIUS (Cresson)

Microdus medius CRESSON, Proc. Ent. Soc. Phila., vol. 4, 1865, p. 298.

Type.—No. 1725, Academy of Natural Sciences, Philadelphia, Pennsylvania.

Resembles *divisus* exceedingly closely in color, differing, however, in having the fore and middle legs beyond the trochanters entirely

pale testaceous, while the posterior coxae are usually black. It differs from *divisus* and resembles *fulvescens* in the strongly bulging temples and cheeks, and in the shorter inner spur of posterior tibiae, also in the longer apical segment of posterior tarsi. Propleura completely polished; radius arising only slightly beyond middle of stigma; hyaline spots in first cubital and second discoidal cells large, confluent, more conspicuous than in *divisus*, the first cubital cell being entirely hyaline except at extreme apex. Head black; thorax black, with the pronotum, propleura, and mesonotum testaceous; sometimes mesopleura testaceous above; abdomen entirely testaceous; coxae, trochanters, apex of hind tibiae, and the hind tarsi black; occasionally the hind coxae testaceous.

The type and the nine specimens which are in the National Museum are all males. The localities represented are points in Colorado, New Mexico, and Kansas.

5. CRASSOMICRODUS PALLENS (Cresson)

Microdus pallens Cresson, Canad. Entom., vol. 5, 1873, p. 53.

Type.—No. 2746, Academy of Natural Sciences, Philadelphia, Pennsylvania.

Most specimens of this species closely resemble *fulvescens* in color, but can be readily separated from that species by the following characters: Inner spur of hind tibia more than half as long as the basitarsus; last segment of hind tarsi not distinctly longer than the third and much shorter than the second; malar space in the male at least two-thirds the eye height, and in the female nearly as long as the eye height; temples and cheeks not strongly bulging, the latter sloping rather evenly, not conspicuously rounded, as seen from in front; hyaline spot in anterior wing less distinct than in *fulvescens;* length normally 4 to 5 mm. Color usually rather uniformly testaceous; head sometimes more or less blackish, very rarely entirely black; antennae black, the scape usually reddish beneath; propodeum sometimes blackish; legs usually entirely yellow, except the apex of hind tibiae and the hind tarsi, which are black; but occasionally the anterior and middle coxae and trochanters, and very rarely the posterior coxae and trochanters as well, blackish.

The type is from Illinois; specimens in the United States National Museum are from Providence, Rhode Island; Huntsville and New Boston, Texas; Georgia; Massachusetts; Rosslyn, Virginia; Alabama; and Riverton, New Jersey. I have also seen two specimens from Meredosia and Havana, Illinois, which are in the collection of the University of Illinois.

6. CRASSOMICRODUS DIVISUS (Cresson)

Microdus divisus Cresson, Canad. Entom., vol. 5, 1873, p. 52.
Orgilus rileyi Ashmead, Proc. U. S. Nat. Mus., vol. 11, 1889 (1888), p. 640.
Epimicrodus diversus Ashmead, (sic!) Proc. U. S. Nat. Mus., vol. 23, 1900, p. 129.
Crassomicrodus divisus Bradley, Psyche, vol. 23, 1916, pp. 139–140.

Type.—No. 1726.1, Academy of Natural Sciences, Philadelphia, Pennsylvania. The type of *rileyi* is in the United States National Museum.

The types of *divisus* and *rileyi* agree perfectly, and unquestionably are the same species. *C. divisus* differs from *medius*, which it closely resembles, as noted in the discussion under that species. The head is usually entirely black; thorax usually mostly black, with the pronotum, propleura, and mesonotum testaceous; anterior and middle legs black or blackish, their tibiae, especially the anterior pair, sometimes mostly pale; posterior coxae usually testaceous, more or less black apically, but varying from entirely black to entirely testaceous; posterior trochanters black, their femora reddish, usually somewhat blackish apically; their tibiae and tarsi usually mostly blackish; abdomen reddish testaceous; wings strongly infumated, the hyaline spots below stigma not so conspicuous as in *medius*. Cheeks and temples broad, but not bulging strongly; the cheeks, as seen from in front, sloping rather evenly, not much rounded; malar space more than half the eye height in the male and about three-fourth as long as the eye height in the female; impression between lateral ocelli shallow, smooth; propleura usually somewhat roughened anteriorly; propodeum slightly rounded, not sloping evenly from base to apex; both spurs of middle tibia much longer than half the basitarsus; inner spur of hind tibiae also considerably longer than hind basitarsus; last segment of posterior tarsi about as long as the third segment and shorter than the second; radius arising considerably beyond the middle of stigma; radial cell measured along wing margin very distinctly longer than half the second abscissa of radius Length usually 7 to 8 mm.

The above notes are based on the types; on about 25 additional specimens of both sexes in the United States National Museum, which are from various localities in Texas, Colorado, Illinois, Ohio, Michigan, Virginia, Louisiana, and Kentucky, and 10 specimens from Illinois in the collection of the University of Illinois.

7. CRASSOMICRODUS NIGRICEPS (Cresson)

Microdus nigriceps Cresson, Trans. Amer. Ent. Soc., vol. 4, 1872, p. 182.

Type.—In the United States National Museum.

The type is a female, although it was originally described as a male, the extremely short ovipositor having been overlooked. It is exceedingly close to *divisus* and may eventually prove to be that spe-

cies; but for the present it seems desirable to hold it distinct. It appears to differ from *divisus* in having the anterior and middle femora and tibiae testaceous, in the almost entirely testaceous thorax, and in the completely polished propleura; but I do not feel at all satisfied that these differences are of specific value.

In addition to the type I have seen only one specimen, collected by C. H. T. Townsend at Brownsville, Texas.

? CRASSOMICRODUS MELANOPLEURUS (Ashmead)

Microdus melanopleurus ASHMEAD, Proc. Calif. Acad. Sci., vol. 4, 1894, p. 125.

I have not seen the type of this species which is apparently in the California Academy of Sciences; but from the short original description it appears to belong to *Crassomicrodus*, and it may very well prove to be *C. medius* (Cresson).

Genus BASSUS Fabricius

Bassus FABRICIUS, Syst. Piez., 1804, p. 93. *Genotype.*—*Ichneumon calculator* Fabricius (by designation of Curtis, Brit. Ent., vol. 2, 1825, p. 73).

Agathis LATREILLE, Hist. Nat. Crust. Ins., vol. 13, 1805, p. 175. *Genotype.*—*Agathis malvacearum* Latreille (Monobasic).

Microdus NEES, Nov. Act. Acad. Nat. Curios, vol. 9, 1818, p. 304. *Genotype.*—*Ichneumon calculator* Fabricius (Monobasic).

Therophilus WESMAEL, Nouv. Mem. Acad. Sci. Brux., vol. 10, 1837, p. 15. *Genotype.*—*Therophilus conspicuus* Wesmael=[(*Microdus*) *Bassus tumidulus*, var. *conspicuus* Wesmael] (by designation of Viereck, Bull. 83, U. S. Nat. Mus., 1914, p. 145).

Eumicrodus FOERSTER, emendation of *Microdus* Nees, Verh. naturh. Ver. preuss. Rheinl., vol. 19, 1862, p. 247.

Lytopylus VIERECK, not Foerster, Trans. Kansas Acad. Sci., vol. 19, 1905, p. 267. *Genotype.*—*Lytopylus azygos* Viereck (Monobasic).

Aerophilopsis VIERECK, Proc. U. S. Nat. Mus., vol. 44, 1913, p. 555. *Genotype.*—*Bassus* (*Aerophilopsis*) *erythrogaster* Viereck (Monobasis).

Westwood[9] designated *Ichneumon laetatorius* Fabricius as the type of *Bassus*, and this interpretation, which placed the genus in the subfamily Tryphoninae of the family Ichneumonidae, has been generally followed. However, Curtis, as noted in the above synonymy, had previously designated *Ichneumon calculator* Fabricius as type, thus making the genus isogenotypic with *Microdus* Nees, and because of the priority supplanting the latter name in the Braconidae. This condition unfortunately was not explained until recently, when Viereck[10] synonymized *Microdus* Nees with *Bassus* Fabricius. *Bassus*, of Authors, as shown by Bradley,[11] is *Diplazon* (Nees) Gravenhorst.

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[9] Intr. Mod. Class. Ins., vol. 2, 1840, Gen. Syn. p. 59.

[10] Bull. 83, U. S. Nat. Mus., 1914, p. 94.

[11] Trans. Ent. Soc. London, 1919, p. 59.

Up to the present *Agathis* Latreille has been held distinct from (*Microdus* Nees) = *Bassus* Fabricius solely on the basis of the length of the face, and on this character it has usually been more closely associated with (*Cremnops* Foerster) = *Bracon* Fabricius, being even treated as a subgenus of *Bracon* by Viereck.[12] Although Lyle[13] considered *Agathis* to be separable from *Bassus* "by characters that are of little more than specific value," he nevertheless held the two distinct, evidently believing the difference in the length of the face to be rather clear-cut. The study of a large amount of material, however, has convinced me that it is virtually impossible to separate species on this character alone; and although I dislike to suppress a name so long and generally employed, I can find no basis upon which to adequately distinguish *Agathis* from *Bassus* and believe it advisable to synonymize the two genera.

Wesmael proposed the name *Therophilus* for a subgenus of *Microdus*, which accounts for the inclusion of this name in the synonymy of *Bassus*. *Aerophilopsis* Viereck was likewise published as merely the name of a subgenus of *Bassus;* and Viereck himself has recently[14] explained that his *Lytopylus* is not the *Lytopylus* of Foerster, but is rather a synonym of his own subgenus *Aerophilopsis*.

The following characters apply to *Bassus*, as I have considered the genus in this paper: Head transverse; face varying from long and rostriform to very short; maxillary palpi normal, five-segmented, not modified to form a long beak; labial palpi four-segmented, the third segment often very short and sometimes hardly distinct; frons usually immargined, but in a few species the frontal impressions are distinctly carinately margined; parapsidal furrows nearly always impressed or indicated, rarely entirely wanting; mesopleural furrow varying from strongly impressed and coarsely foveate to very weak and completely smooth; sculpture of propodeum variable; first cubital and first discoidal cells confluent; second cubital cell usually very small, triangular, never broadly sessile, the second abscissa of radius rarely present and then very short; length of submediellan cell variable, the first abscissa of mediella varying from much shorter to distinctly longer than the second; legs moderate; inner spur of posterior tibia rarely quite half as long as the basitarsus; posterior basitarsus not incrassate; tarsal claws not cleft, but with a basal tooth which is usually broad and pronounced; abdomen sessile, the basal tergites sometimes more or less sculptured, the first often with one or two conspicuous dorsal longitudinal keels; ovipositor prominently exserted, the sheaths at least as long as the abdomen.

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[12] Bull. 22, Conn. Geol. and Nat. Hist. Survey, 1917 (1916), p. 231.

[13] The Entomologist, vol. 53, 1920, p. 177.

[14] Proc. U. S. Nat. Mus., vol. 59, 1921, p. 139.

This is the largest and probably the most important of our genera of Braconinae. Unfortunately nothing is known regarding the host relationships of most of our species. A few of them, however, have been rather commonly reared; and wherever authentic host records are available these will be mentioned in the discussions of the various species.

KEY TO THE SPECIES OF BASSUS.

Bassus rugareolatus Viereck, *B. quebecensis* (Provancher), and *B. verticalis* (Cresson) are not included in this key. See discussion of these species in the text.

1. Frontal impressions margined by carinae; first abdominal tergite with a median longitudinal elevation, usually in the form of a polished keel, arising at the posterior margin of the basal impression and extending posteriorly; scutellum more or less distinctly carinately margined at apex; head not, or only slightly, excavated behind; third segment of labial palpi very short, sometimes scarcely apparent; antennae normally 38 to 50 segmented; second cubital cell large, triangular, generally sessile; second abscissa of mediella much longer than the first; large species, usually measuring 7 to 9 mm. in length ---------- 2.
   Frontal impressions immargined; otherwise not combining all the above characters ---------- 7.
2. Thorax, except usually the metapleura and propodeum, black; mesonotum always black ---------- 6.
   Thorax testaceous or ferruginous, at most with the prothorax, the pectus and the sutures surrounding the scutellum black; mesonotum never black ---------- 3.
3. Anterior and middle legs entirely testaceous—1. **marginatifrons**, new species.
   Anterior and middle legs mostly black ---------- 4.
4. Inner spur of posterior tibia not half as long as the basitarsus; propodeum weakly sculptured, with lateral longitudinal carinae and two weak, nearly parallel median longitudinal carinae, not areolated; ovipositor sheaths considerably longer than the body ---------- 5.
   Inner spur of posterior tibia half as long as the basitarsus; propodeum completely areolated, the separating carinae very prominent, the areas rugose within; metapleura rugoso-reticulate; first abdominal tergite rugose on either side of the prominent median longitudinal keel
   2. **floridanus**, new species.
5. First abdominal tergite smooth, the basal impression not completely margined by carinae, and the median elevation behind the impression poorly defined, not developed into a sharp keel; furrow in front of scutellum not distinctly pitted; inner spur of posterior tibia only slightly less than half the basitarsus ---------- 3. **nigrotrochantericus** (Viereck).
   First abdominal tergite with the basal impression completely margined by strong carinae, which unite behind the impression to form a sharp prominent median ridge; furrow in front of scutellum with several pits; inner spur of hind tibia much shorter than half the basitarsus
   4. **imitatus** (Cresson).
6. Inner spur of of middle tibia much longer than half the middle basitarsus; inner spur of posterior tibia at least half as long as the posterior basitarsus; scutellum strongly margined at apex; ovipositor sheaths only a little longer than the abdomen ---------- 5. **texanus** (Cresson).

Inner spur of middle tibia not distinctly more than half as long as the middle basitarsus; inner spur of posterior tibia distinctly less than half the posterior basitarsus; scutellum very weakly margined at apex; ovipositor sheaths about, or very nearly, as long as the body
6. **sanctus** Say.

7. First, second, and most of the third abdominal tergites closely evenly striate; parapsidal furrows sharply impressed and finely foveolate; face short and very broad; abdomen red or testaceous, the first tergite never black---8.
First, second, and third tergites not so completely striate or at least not combining the above characters--9.

8. Head and thorax black; legs mostly blackish----7. **aciculatus** (Ashmead).
Head, thorax, and legs testaceous-----------8. **abdominalis**, new species.

9. Parapsidal furrows completely wanting; mesoscutum with a more or less pronounced median longitudinal impression posteriorly; abdomen polished, the first tergite sculptureless and without two distinct dorsal longitudinal keels; propodeum smooth, with only a more or less distinct median area; second cubital cell large, subtriangular, sessile; face never rostriform; inner spur of posterior tibia usually distinctly half as long as the basitarsus; anterior and middle legs black; posterior coxae and trochanters usually black--10.
Parapsidal furrows usually at least indicated, rarely wanting, and then not exhibiting the above combination of characters--------------------11.

10. Head and thorax entirely black; wings strongly infumated
9. **rufofemoratus**, new species.
Head varying from black to mostly ferruginous; thorax yellowish ferruginous, with the pectus sometimes black; wings very weakly dusky
10. **azygos** (Viereck).

11. First abdominal tergite with two more or less prominent widely separated dorsal longitudinal keels which arise at the outer margin of the basal impression and extend posteriorly; abdomen always red or testaceous; anterior and middle legs nearly always mostly black or blackish, very rarely (*tenuiceps*) yellow; metapleura and posterior coxae never evenly granular; parapsidal furrows more often smooth than foveolate, sometimes very weak or even wanting; wings usually dark--------------------------12.
First abdominal tergite rarely with such dorsal longitudinal keels, and then the abdomen is mostly black or the basal abdominal tergites, the metapleura, and posterior coxae are finely granular; anterior and middle legs very rarely black beyond the trochanters, and then the abdomen is mostly black; parapsidal furrows usually sharply impressed and finely foveolate or punctate; wings often hyaline or nearly---------------27.

12. Propodeal spiracles exceptionally large, greatly elongated, slitlike, less than their length from the anterior margin of propodeum; antennae 45 to 55 segmented; first abscissa of mediella much shorter than the second; ovipositor sheaths about as long as the abdomen; a large species, usually 7 to 10 mm. long-------------------------11. **spiracularis**, new species.
Propodeal spiracles normal, round or oval----------------------------13.

13. First abscissa of mediella distinctly longer than the second; nervellus strongly angled outwardly at or above its middle and emitting a distinct discoidella from this angle; parapsidal furrows impressed and nearly always finely foveolate; mesopleural furrow foveolate and extending to the middle of mesepisternum or beyond; black, with propodeum, metapleura, and abdomen red or reddish testaceous; posterior coxae, trochanters, and femora red--------------------12. **simillimus** (Cresson).

Venation of hind wing not as above; parapsidal furrows nearly always entirely polished; mesopleural furrow smooth, not foveolate, usually very weak ---------- 14.

14. Face elongate, rostriform or subrostriform, usually fully as long from antennal foramina to apex of clypeus as broad; clypeus long; malar space not strongly inclining inwardly and usually at least two-thirds as long as the eyes; cheeks not bulging; head strongly hollowed out behind; third segment of labial palpi not especially short ---------- 15.

Face not elongate, distinctly broader than long from antennal foramina to apex of clypeus; clypeus twice as broad as long; malar space strongly inclining inwardly and usually much shorter; third segment of labial palpi usually much reduced, sometimes minute ---------- 19.

15. First abdominal tergite polished, not striate between the dorsal keels; second and following tergites also polished; thorax mostly testaceous; the mesoscutum always testaceous; propodeum usually smooth, not completely areolated, with only a long narrow median area and indistinctly defined basal lateral areas ---------- 16.

First abdominal tergite usually striate or striato-granular; if smooth, then mesoscutum is more or less black; thorax varying from mostly testaceous to entirely black; propodeum usually more completely areolated with the transverse apical carina nearly always distinct ---------- 17.

16. Antenna normally 34 to 36 segmented; parapsidal furrows indicated, the mesonotal lobes weakly defined; the ridge between antennae prominent and descending rather abruptly behind; first abscissa of mediella slightly shorter than the second; legs completely black ---- 13. **atripes** (Cresson).

Antenna normally 25 to 29 segmented; parapsidal furrows wanting, the lobes not defined; the ridge between antennae not so high nor descending abruptly behind; first abscissa of mediella rarely distinctly shorter than the second; legs usually more or less marked with yellow

14. **nigripes** (Cresson).

17. First abdominal tergite, usually the second, and sometimes the third, more or less striate or striato-granular; propodeum usually rather completely areolated, with two nearly parallel median longitudinal carinae enclosing a long narrow median area and the petiolarea, and with the basal lateral and apical lateral areas usually delimited; wings uniformly infumated; thorax usually more or less red ---------- 18.

First abdominal tergite smooth and polished, with the two dorsal keels usually not extending to the middle of the tergite; propodeum mostly smooth, with a broad poorly defined median area that is open behind; petiolarea and lateral areas not delimited; wings very nearly hyaline; thorax entirely black; first abdominal tergite black except at apex

15. **bakeri**, new species.

18. Antennae stout at base, tapering distinctly to the apex; first abdominal tergite fully as broad at apex as long and longitudinally wrinkled; remainder of abdomen polished; thorax stout; elevated lines on propodeum very prominent; length normally about 7 to 8 mm.

16. **crassicornis**, new species.

Antennae slender, not tapering to the apex; second and third abdominal tergites sometimes more or less sculptured; length usually 3.5 to 5 mm.

17. **perforator** (Provancher).

19. First abscissa of mediella distinctly shorter than the second; parapsidal furrows sharply impressed, the middle mesonotal lobe prominently elevated; propodeum regularly areolated, the separating carinae prominent, the areas usually smooth within; third segment of labial palpi extremely short, sometimes indistinct; antennae usually 35 to 40 segmented; thorax black, with propodeum and metapleura nearly always red------------------20.

First abscissa of mediella rarely distinctly shorter than the second; parapsidal furrows usually weakly impressed, the middle mesonotal lobe not prominently elevated; propodeum usually not so regularly areolated or the areas rugose within; third segment of labial palpi short but nearly always distinct and longer than broad; antennae usually 23 to 33 segmented, rarely with as many as 36 segments; color of thorax varying from entirely black to entirely testaceous------------------------------------22.

20. Posterior trochanters black; hind wings not completely infumated, the area behind the mediella being usually mostly hyaline
18. **calcaratus**, (Cresson).

Posterior trochanters red, very rarely a little infuscated; hind wings uniformly infumated---21.

21. Apical segment of all tarsi yellow; second cubital cell strongly petiolate, the petiole considerably longer than the first abscissa of radius
19. **usitatus** Gahan.

All tarsi entirely black or blackish; second cubital cell nearly sessile, the petiole, if distinct, not longer than the first abscissa of radius
20. **difficilis**, new species.

22. Head unusually thin antero-posteriorly, the temples receding sharply; parapsidal furrows not at all distinct; anterior and middle legs yellow; head, thorax, and abdomen testaceous------------21. **tenuiceps**, new species.

Head not especially thin, the temples not receding sharply; parapsidal furrows more or less distinctly indicated; anterior and middle legs blackish; head and thorax usually more or less black--------------------------23.

23. Propodeum neither areolated nor rugose, mostly smooth, only slightly roughened down the middle; dorsal face of propodeum long, not rounded antero-posteriorly; pleura conspicuously pubescent; antennae usually 33 to 36 segmented; dorsum of thorax usually mostly red; mesopleura and pectus black; posterior coxae and trochanters more or less blackish
22. **ninanae**, new species.

Propodeum more or less distinctly areolated or rugose, rarely mostly smooth, and then the dorsal face short and strongly rounded; at least not agreeing entirely with the above characters--------------------------------24.

24. Posterior coxae, trochanters, and femora uniformly reddish testaceous; mesonotum always black---25.

Posterior trochanters, usually at least the base of the hind femora and more or less of the hind coxae, black or blackish; thorax varying from entirely black to entirely red or reddish testaceous; the mesonotum often pale--26.

25. Antenna normally 32 to 36 segmented; parapsidal furrows very weak anteriorly; temples bulging slightly but very narrow; propodeum and metapleura nearly always red------------------23. **acrobasidis** Cushman.

Antenna normally 27 to 29 segmented; parapsidal furrows sharply impressed anteriorly; temples not very narrow; usually the propodeum, and often the metapleura, black---------------------24. **erythrogaster** Viereck.

26. Antenna normally 23 to 27 segmented; propodeum and metapleura usually red; very often mesopectus, mesopleura, and more or less of propleura red; mesoscutum always black or blackish; second abdominal tergite often mostly striate------------------------------------25. **buttricki** Viereck.

Antenna normally 29 to 33 segmented; thorax varying from entirely black to entirely reddish testaceous; propodeum and pectus rarely pale, and then the mesoscutum is always testaceous; second tergite never mostly striate------------------------------------26. **bicolor** (Provancher).

27. First abdominal tergite, often the second, and sometimes the third finely evenly granular or faintly reticulate; metapleura and hind coxae often finely granular and opaque------------------------------------35.

First abdominal tergite usually, and sometimes the second, more or less longitudinally striate or rugulose, never evenly granular; metapleura never evenly granular------------------------------------28.

28. Malar space short, distinctly less than half as long as the eyes; clypeus only slightly convex, short and broad, more than twice as broad as long; face rather flat; clypeal foveae not below the level of the lower margin of the eyes; occiput not strongly excavated------------------------------------33.

Malar space about half, or more than half, as long as the eyes; clypeus usually long and strongly convex, sometimes elevated anteriorly; clypeal foveae nearly always below the level of the lower eye margin; head strongly hollowed out behind------------------------------------29.

29. Thorax testaceous or ferruginous, with the propodeum and pectus sometimes more or less black; abdomen at most black apically; second and following tergites completely polished; face very broad, not rostriform -----30.

Thorax entirely black; abdomen usually black or with the second segment ferruginous, rarely abdomen mostly ferruginous; second abdominal tergite often more or less rugulose or irregularly striate; face usually rostriform or subrostriform------------------------------------31.

30. Posterior tibiae with a flange like expansion outwardly at apex; posterior basitarsus distinctly less than half as long as posterior tibia; upper margin of eyes distinctly below the vertex; propodeum finely rugulose, with two more or less distinct widely-separated median longitudinal carinae; all coxae testaceous; ovipostor sheaths a little longer than the body
27. **laticeps**, new species.

Posterior tibiae without such apical expansion; posterior basitarsus more than half as long as posterior tibia; eyes attaining the vertex; propodeum rugose, without a distinct elongate median area; anterior and middle coxae blackish; ovipositor sheaths distinctly shorter than the body
28. **terminatus** (Cresson).

31. Labial palpi short, the third segment very short and much narrower than the fourth; tarsal claws with a large broad basal tooth; second cubital cell triangular, the second abscissa of radius usually not distinct; malar space usually about half as long as the eyes; first and second abdominal tergites nearly always closely ruguloso-striate; wings nearly hyaline; abdomen varying from entirely black to mostly ferruginous-----29. **gibbosus** Say.

Labial palpi elongate, the third segment not especially short and narrow; tarsal claws with the basal tooth small or indistinct; second cubital cell usually four-sided, the second abscissa of radius usually distinct though short; malar space usually three-fourths as long as the eyes; first abdominal tergite usually more or less striate, the second sometimes irregularly striate; abdomen black, very rarely the second tergite tinged with reddish------------------------------------32.

32. Antenna normally 22 to 23 segmented; length 4 to 6 mm.; tarsal claws with basal tooth not at all distinct; ovipositor sheaths as long as the body
30. **brevicornis**, new species.

Antenna normally 25 to 27 segmented; length, 2.5 to 4 mm.; tarsal claws with basal tooth weak but distinct; ovipositor sheaths shorter
31. **tibiator** (Provancher).

33. Temples with a prominent bulge or rounded tubercule; scutellum more or less distinctly carinately margined at apex; propodeum with two median longitudinal carinae setting off a long narrow median area; all coxae entirely yellow; wings hyaline; color of the head, thorax, and abdomen varying from entirely black to entirely testaceous
32. **annulipes** (Cresson).

Temples without such a bulge, receding strongly; otherwise, not the above combination of characters------34.

34. Abdomen stout; first abdominal tergite much broader at apex than the second is long; the second tergite broader than long, in the female nearly twice as broad as long, completely polished; color of the abdomen varying from entirely testaceous to black with the second and third tergites pale; face usually more or less testaceous; the superior orbits narrowly ferruginous even when the head is otherwise entirely black
33. **carpocapsae** Cushman.

Abdomen slender; first abdominal tergite not distinctly broader at apex than the second tergite is long; second tergite usually about as long as broad and usually weakly striate; abdomen black, with more or less of the second tergite usually yellowish; head black, the superior orbits not pale
34. **laticinctus** (Cresson).

35. Propodeum very finely evenly granular like the first adbominal tergite, and without carinae; head, thorax, and abdomen uniformly yellow
35. **immaculatus** Gahan.

Propodeum more or less rugose, more coarsely sculptured than the first abdominal tergite, or with two median longitudinal carinae------36.

36. Face elongate, subrostriform; head strongly hollowed out behind; thorax depressed, hardly higher than broad; propodeum mostly granular, with two conspicuous very slightly divergent median longitudinal carinae; propleura mostly and the metapleura closely granular and opaque; antenna normally 26 to 30 segmented; head and thorax black; abdomen black, with the second segment more or less rufous; all coxae black; remainder of legs ferruginous------36. **rubripes** (Cresson).

Face not subrostriform; head only very slightly hollowed out behind; antenna usually more than 30 segmented; at leas tnot agreeing entirely with the above------37.

37. Posterior femora black or blackish; all coxae black; head, thorax, and abdomen wholly black, the second abdominal tergite rarely more or less brownish------38.

Posterior femora reddish testaceous------39.

38. Second and base of third abdominal tergites closely granular and opaque; tegulae black; basal segment of all trochanters black; abdomen completely black, the second tergite not at all brownish
37. **nigricoxus** (Provancher).

Second and third tergites polished, the second with a faint suggestion of reticulation, and sometimes more or less brown; tegulae yellow; all trochanters entirely yellow------38. **coleophorae** Rohwer.

39. All coxae black; first abdominal tergite very faintly reticulately sculptured and strongly shining; second and following tergites polished; malar space at least half as long as the eyes; head and thorax black; abdomen black, with second and usually base of third tergites brownish; ovipositor sheaths nearly as long as the body
39. **californicus**, new species.

Anterior and middle coxae very rarely black and then not agreeing entirely with the above -- 40.

40. First abdominal tergite completely black; the second usually more or less yellowish; the third and following entirely black; head and thorax always black; antenna usually 30 to 36 segmented
40. **cinctus** (Cresson).

First and second tergites, and sometimes more, of the abdomen red; rarely the first tergite partly blackish; head and thorax sometimes varied with ferruginous or testaceous -- 41.

41. Head black with more or less of the clypeus usually reddish yellow; thorax entirely black; propleura rugulose anteriorly, polished behind; abdomen usually with the apical half of third and all of the following tergites black
41. **agilis** (Cresson).

Head usually mostly testaceous; thorax varying from entirely black to entirely yellowish ferruginous; propleura usually evenly granular, not rugulose anteriorly ---------------------------- 42. **discolor** (Cresson).

1. BASSUS MARGINATIFRONS, new species

Female.—Length, 8.5 mm. Face apparently a little broader than long from antennal foramina to apex of clypeus, with a small, shallow, median impression just below antennae; malar space less than half the eye height; maxillary palpi rather long, the two basal segments somewhat thickened, the three apical segments slender; labial palpi stout, the third segment exceedingly small, scarcely apparent; eyes large, prominent, broadly oval, attaining the vertex, which is not at all convex; frontal impressions distinctly carinate, a carina arising at each side near the eye and extending toward the lateral ocelli, but bending sharply downward before attaining the latter, and converging below the median ocellus; ocelli prominent; ocell-ocular line fully twice as long as the diameter of an ocellus; occiput flat, not excavated; antennae long, stout, tapering slightly, 51-segmented in type all the flagellar segments longer than broad; thorax rather slender, distinctly deeper than broad, mesonotal lobes prominent, defined by distinct, polished parapsidal grooves; the middle lobe with a weak median longitudinal ridge: scutellum slightly convex, with a transverse impression just before apex and the apex margined by an irregular carina; suture in front of scutellum deep and broad, divided into two pits by a median septum; propodeum polished, with a short basal median carina which divides to set off a long, narrow, triangular areola; basal lateral areas not delimited; lateral longitudinal carinae and apical transverse carina prominent; petiolarea defined; propodeal spiracle rather large, elliptical; propleura completely polished; mesopleura polished, with a broad, coarsely foveate longitudinal furrow;

metapleura polished; stigma long and narrow, with radius arising from beyond its middle; areolet large, sessile, triangular; second intercubitus weakly bent near the middle; nervulus practically interstitial; first abscissa of mediella much shorter than the second; nervellus slightly bent inwardly below; discoidella not distinct; legs slender; posterior coxae rather long, polished; inner spur of middle tibia a little longer than half the basitarsus; inner spur of hind tibia just about equal to half the posterior basitarsus; hind tarsi slender, the third segment distinctly longer than the fifth; abdomen slender, first tergite nearly twice as long as broad at apex, very narrow at base, completely polished, with an impression at base and a low polished median longitudinal ridge arising behind this impression, the latter not sharply margined by carinae; second and following tergites polished; second tergite about as long as broad; ovipositor sheaths a little longer than the body. Testaceous; head and antennae black, palpi pale; area between clypeal foveae and eyes rufous in type; propectus margined with blackish; otherwise thorax wholly testaceous; abdomen wholly testaceous; wings strongly infumated; anterior and middle legs entirely testaceous, with only tarsal claws blackish; posterior legs testaceous, with the trochanters, apex of tibiae, and the tarsi blackish.

Type.—Cat. No. 28679, U.S.N.M.

Type locality.—Pyziton, Clay County, Alabama.

Described from a single specimen collected by H. H. Smith.

2. BASSUS FLORIDANUS, new species

Male.—Length, 9 mm. Face broader than long from antennal foramina to apex of clypeus, with a slight median incision just below antennae; clypeus broad, only slightly convex, truncate at apex; palpi as in *marginatifrons;* eyes rather large, attaining the vertex, which is not at all convex; frontal impressions margined by carinae as described for *marginatifrons;* ocell-ocular line about twice the diameter of an ocellus; occiput flat, not excavated; antennae rather stout, 51-segmented in type, all the flagellar segments longer than broad; thorax slender, not as broad as high; pronotal pits large, deep, and sharply margined; parapsidal furrows impressed, polished; middle lobe of mesoscutum very prominent, with a low polished ridge down the middle; scutellum a little convex, polished, margined at apex by a distinct carina; propodeum coarsely, rather regularly, areolated, the areas rugose within; petiolarea not distinctly separated from the areola; the basal, middle, and apical lateral areas sharply delimited; propodeal spiracle large, elliptical; propleura polished; mesopleural furrow coarsely foveate; metapleura rugose-reticulate; stigma long and narrow; radius arising from beyond middle of stigma; areolet large, triangular, sessile; nervulus slightly postfurcal; first

abscissa of medella shorter than the second; nervellus not angled, slightly curved inwardly below; legs rather slender; hind coxae long; inner spur of middle tibia not distinctly longer than half the middle basitarsus; inner spur of hind tibia much longer than the outer and just about half as long as posterior basitarsus, third segment of hind tarsi distinctly longer than the fifth; abdomen rather narrow; first tergite very narrow at base, much longer than broad at apex, and with a deep triangular pit at base which is margined by sharp ridges that unite behind to form a prominent median longitudinal keel extending to the apical third of the tergite; on either side of this keel the tergite is rugose; second and following tergites polished. Ferruginous; head and antennae entirely black; palpi blackish or dusky except at tips; thorax, except the propectus which is black, red; wings strongly infumated; anterior and middle legs black, except the anterior tarsi which are yellowish and the middle tarsi which are brownish; posterior coxae and femora red; posterior trochanters, tibiae, and tarsi black; abdomen wholly red.

Type.—Cat. No. 28680, U.S.N.M.

Type locality.—Biscay Bay, Florida.

Described from a single male specimen. Undoubtedly additional material will exhibit some variation in the extent of the black markings of the thorax, and the female will probably be found to have darker anterior tarsi than the type.

3. BASSUS NIGROTROCHANTERICUS (Viereck)

Microdus nigrotrochantericus VIERECK, Trans. Kansas Acad. Sci., vol. 19, 1905, p. 275.

Type.—In the University of Kansas.

Exceedingly close to *imitatus* (Cresson) and possibly the same species. Because of the lack of intergrading forms, however, it seems best to hold it distinct for the present. The unique type differs principally from that of *imitatus* by the characters noted in the key, but these differences are found to vary more or less in related species which are represented by more material, and may prove inadequate for the separation of *nigrotrochantericus* from *imitatus*.

Face a little broader than long to the apex of clypeus; head flat behind; eyes attaining the vertex; thorax slender; parapsidal grooves impressed, polished, not foveolate; the middle lobe of mososcutum with a low polished longitudinal median ridge; furrow in front of scutellum not distinctly pitted; scutellum weakly carinate at apex; propodeum rather evenly rounded from base to apex, with a low polished median longitudinal ridge and a weak irregular carina adjoining this ridge on either side; propleura completely polished; mesopleura polished with a short weakly foveolate longitudinal furrow; metapleura smooth, weakly punctate; inner spur of middle tibia about half as

long as middle basitarsus; inner spur of hind tibia slightly less than half the posterior basitarsus, which is distinctly longer than the remaining segments of hind tarsi combined; radius arising from a little beyond middle of stigma; areolet large, subtriangular, sessile; first abscissa of mediella considerably shorter than the second; abdomen very slender, narrower than thorax, completely polished; first tergite long and narrow, nearly twice as long as broad at apex; the basal impression on first tergite not completely margined and the median elevation behind this impression short and not prominent, not developed into a sharp keel; second tergite about as long as broad at apex; ovipositor sheaths considerably longer than the body; hypopygium very slightly surpassing apex of last dorsal segment. Head entirely black; thorax yellow-ferruginous, except the propectus which is black; anterior and middle legs black, posterior coxae and femora red, their trochanters, tibia, and tarsi black; wings strongly infumated; abdomen yellowish ferruginous.

The foregoing notes are based on the type, the only known specimen, which is from Douglas County, Kansas.

4. BASSUS IMITATUS (Cresson)

Microdus imitatus Cresson, Canad. Ent., vol. 5, 1873, p. 51.

Type.—No. 1721, Academy of Natural Sciences, Philadelphia, Pennsylvania.

Very similar to *nigrotrochantericus* as noted under that species. In addition to the differences included in the key, the type of *imitatus*, which is the only specimen of this species that I have seen, differs from *nigrotrochantericus* in the more extensive black markings of the thorax. The prothorax is entirely black, and the sutures surrounding the scutellum and the mesopectus are black. This coloration, however, doubtless varies more or less. The species can at once be separated from *sanctus* by the decidedly more slender thorax and abdomen, the considerably longer ovipositor, the weaker sculpture of the propodeum, and the ferruginous mesonotum and mesopleura. The antennae are 41-segmented in the type and apparently taper less strongly than in *sanctus*.

Recorded only from Massachusetts.

5. BASSUS TEXANUS (Cresson)

Microdus texanus Cresson, Trans. Amer. Ent. Soc., vol. 4, 1872, p. 181.

Type.—No. 1723, Academy of Natural Sciences, Philadelphia, Pennsylvania.

This species is very similar to *sanctus*, but can be rather easily separated by the longer tibial spurs and the shorter ovipositor. The thorax in general is more compact, appearing shorter and distinctly

deeper, and the propodeum is more strongly areolated than in most specimens of *sanctus*, the separating carinae being very prominent; the scutellum is usually shorter and broader in *texanus* and has the apical carina much more strongly developed.

Head rather flat behind; eyes prominent, attaining the vertex; third segment of labial palpi minute; antennae about 40 to 46 segmented; parapsidal furrows strongly impressed, the mesonotal lobes prominent; propodeum coarsely regularly areolated, the median area elongate-subtriangular, separated from the petiolarea; the lateral areas well defined; mesopleural furrow usually broad and coarsely foveate; the nervulus in the anterior wing varies from interstitial with the basal vein to distinctly postfurcal; first abdominal tergite with a small deep basal impression, which is usually not completely margined by prominent carinae; the median longitudinal ridge behind this basal impression varies from very weak to very prominent; ovipositor sheaths only a little longer than the abdomen. Head and thorax black, the propodeum and metapleura varying from red to black; anterior and middle legs black, their tarsi usually yellowish in the male; posterior trochanters and tarsi black; posterior tibiae varying from entirely black to almost entirely red; wings strongly infumated; abdomen red.

The above notes are based on the following material: The type, which is from Texas, and three additional specimens, one from Illinois and two from Georgia, in the Philadelphia Academy of Sciences; one specimen, collected by C. W. Johnson at Danbury, Vermont, in the Boston Society of Natural History collection; and more than 40 specimens in the United States National Museum, which are from various localities in Texas, Louisiana, Georgia, Florida, Alabama, Mississippi, Virginia, North Carolina, Maryland, New York, Iowa, and British Columbia.

Nothing is known of the host relationships of this species.

6. BASSUS SANCTUS Say

Bassus sanctus SAY, Boston Journ. Nat. Hist., vol. 1, 1836, p. 249.

Type—Lost.

As pointed out in the discussion under *texanus*, *sanctus* is very similar to that species, but may be readily separated by the differences there mentioned. The brief general characterization of *texanus* given above will apply to *sanctus*, with the following exceptions: Propodeum usually less coarsely areolated, the lateral areas sometimes not distinctly defined; mesopleural furrow usually narrow and more weakly foveolate; nervulus interstitial with basal vein or very slightly antefurcal; ovipositor sheaths about as long as the body or very nearly; propodeum and metapleura always yellowish ferruginous.

The more important differences between *sanctus* and *imitatus* are mentioned in the dicussion of the latter species.

The following material of *sanctus* has been examined: Several specimens in the Philadelphia Academy of Sciences from New Jersey, Virginia, Louisiana, Texas, and Georgia; a single specimen in the collection of the Boston Society of Natural History, from Westport, Massachusetts (C. W. Johnson); six specimens from Illinois in the collection of the University of Illinois; and 16 specimens in the United States National Museum, from Michigan, Illinois, Indiana, Ohio, West Virginia, North Carolina, Louisiana, Kansas, and Connecticut. There is also one specimen at the Gipsy Moth Laboratory, Melrose Highlands, Massachusetts, recorded as reared from a larva of *Pyrausta pertextalis* Lederer, from Bedford, Massachusetts.

7. BASSUS ACICULATUS (Ashmead)

Microdus aciculatus Ashmead, Proc. U. S. Nat. Mus., vol. 11, 1889 (1888), p. 639.

Type.—In the United States National Museum.

Closely resembles *abdominalis*, from which it differs most conspicuously in having the head and thorax black and the legs more or less blackish. Face much broader than long to the apex of clypeus; malar space about half the eye height; temples distinctly bulging a little, not strongly receding as is *abdominalis*; third segment of labial palpi minute; antennae very slender; parapsidal grooves sharply impressed, minutely foveolate; middle mesonotal lobe prominent anteriorly; propodeum rugulose, not distinctly areolated; mesopleural furrow smooth; posterior tibiae strongly thickened at apex and with numerous short stout spines above the outer terminal spur; inner spur of hind tibia a little less than half the basitarsus; last segment of hind tarsi longer than the third; second cubital cell subsessile or shortly petiolate; first abscissa of mediella about as long as the second; first abdominal tergite slightly longer than broad at apex and provided with two widely separated dorsal longitudinal keels; first, second, and most of third tergites closely longitudinally aciculate; ovipositor sheaths longer than the abdomen but shorter than the body. Head and thorax black; abdomen ferruginous; all coxae and trochanters black or blackish; rest of legs mostly reddish brown, more or less tinged with blackish; wings weakly infumated.

Known only from the type series, which is from Texas.

8. BASSUS ABDOMINALIS, new species

Very similar to *aciculatus* in habitus and sculpture, but at once distinguished by the testaceous head and thorax and pale legs.

Female.—Length, 5 mm. Head strongly transverse; face much broader than long to the apex of clypeus, rather flat; eyes short oval; malar space usually distinctly more than half as long as the eyes;

labrum short and broad, broadly truncate at apex; labial palpi short; the third segment minute, sometimes indistinct; frontal impressions shallow, immargined; occiput not strongly excavated; temples very narrow, strongly receding; antennae very slender, about as long as the body, 36-segmented in the type; pronotal pits shallow, not margined; parapsidal furrows sharply impressed, very finely punctate, the lobes well set off, the middle lobe prominent; furrow in front of scutellum pitted; scutellum smooth, slightly convex, not margined at apex; propodeum rugulose, usually not distinctly areolated; propodeal spiracle small, short oval; pleura polished; mesopleural furrow narrow, smooth, or finely foveolate; posterior coxae longer than broad, polished; inner spur of hind tibia slightly longer than the outer and nearly half as long as the basitarsus; apical segment of hind tarsi about as long as the third; radius arising from about the middle of stigma; areolet triangular, subpetiolate, or with a short petiole; nervulus postfurcal; first abscissa of mediella about as long as the second, sometimes faintly shorter; nervellus usually a little angled or curved above the middle; abdomen about as long as the head and thorax combined; first tergite longer than broad at apex, only slightly impressed at extreme base, rather evenly striate, and with two more or less distinct dorsal longitudinal keels on the basal half; second and third tergites each with a transverse impression, the second entirely and the third except at apex closely longitudinally aciculate; tergites beyond the third very short; ovipositor sheaths a little shorter than the body. Head, thorax, and abdomen entirely ferrugino-testaceous; antennae brownish black; legs uniformly yellowish ferruginous, apex of hind tibiae and the hind tarsi more or less blackish; wings weakly infumated.

Male.—Essentially as in the female.

Type.—Cat. No. 28681, U.S.N.M.

Type locality.—Louisiana.

Described from seven females and six males, labeled "Loui., Collection C. F. Baker." In addition to the type series the National Museum has one specimen from Opelousas, Louisiana, and one from Jacksonville, Florida.

9. BASSUS RUFOFEMORATUS, new species

Distinguished particularly by the complete absence of parapsidal furrows, the polished propodeum, the completely polished abdomen, and the large sessile second cubital cell.

Female.—Length, 6.5 mm. Face rather flat, polished, distinctly broader than long to the apex of clypeus; a slight median incision on face below antennae; eyes large, attaining the vertex which is not transversely convex; malar space much less than half the eye-height; clypeus at least twice as broad as long; third segment of labial palpi

not greatly reduced, more than half as long as the second or fourth segments; frons only very slightly impressed; ocell-ocular line about twice as long as the diameter of an ocellus; head only slightly hollowed out behind; temples not swollen, receding gradually behind the eyes; antennae rather stout, broken, 28 segments remaining; scape large and stout; pronotal pits rather large; mesoscutum completely polished, the parapsidal furrows entirely wanting; a conspicuous median longitudinal impression posteriorly on mesoscutum; furrow in front of scutellum with several distinct pits; scutellum slightly convex, polished, not margined at apex; propodeum polished, with two median carinae which meet before attaining the apex; propodeal spiracle small, short oval; pro, meso, and meta pleura completely polished; mesopleural furrow only weakly indicated, smooth; posterior coxae large, elongate; inner spur of hind tibia about half as long as the basitarus; second cubital cell large, subtriangular, sessile; first abscissa of mediella slightly shorter than the second; nervellus straight; discoidella entirely wanting; abdomen fully as long as the head and thorax combined, completely polished; first tergite about as broad at apex as long, without two distinct dorsal longitudinal keels; second and third tergites nearly twice as broad as long, each with a weak, smooth, transverse impression; ovipositer sheaths longer than the abdomen, but shorter than the body. Head and thorax entirely black; the palpi whitish, black at base; anterior and middle legs black, their tarsi brown with the apical segment yellowish; posterior coxae and trochanters black, their femora entirely red, their tibiae and tarsi blackish; wings strongly infumated; abdomen red.

Type.—Cat. No. 28685, U.S.N.M.

Type locality.—Lawrence, Kansas.

Described from a single specimen collected by Hugo Kahl, July 8, 1896.

10. BASSUS AZYGOS (Viereck)

Lytopylus azygos Viereck, Trans. Kans. Acad. Sci., vol. 19, 1905, p. 267.
Microdus agathoides Viereck, Trans. Kans. Acad. Sci., vol. 19, 1905, p. 277.

Type.—The holotypes of both *azygos* and *agathoides* are in the collection of the University of Kansas.

A comparison of the type specimens shows conclusively that they are conspecific. No importance can be attached to the slight color differences in view of the variations in color found in related forms. Face distinctly broader than long, polished; malar space about half as long as the eyes; frontal impressions immargined; temples gradually receding; parapsidal furrows wanting; mesoscutum with a slight median longitudinal impression posteriorly; propodeum mostly smooth with a rather large median area that is open behind, and

a median longitudinal carina on the posterior third; mesopleural furrow very weakly impressed, polished; inner spur of posterior tibia fully half as long as the basitarsus; apical segment of hind tarsi very large, about as long as the second segment; second cubital cell large, triangular, sessile, both intercubiti straight; first abscissa of mediella about as long as the second; nervellus straight; discoidella entirely wanting; abdomen completely polished; the first tergite without dorsal longitudinal keels and entirely sculptureless, about as broad at apex as long. Head varying from almost entirely testaceous to entirely black; thorax testaceous, usually with the pectus more or less black; anterior and middle coxae and trochanters and the posterior trochanters black; posterior coxae varying from mostly reddish testaceous to entirely black; fore and middle femora, tibiae, and tarsi more or less brownish, the femora sometimes blackish basally; posterior femora testaceous; their tibiae and tarsi blackish; wings very faintly dusky; abdomen testaceous.

The above notes are based on the two holotypes, both of which are from Morton County, Kansas, at 3,200 feet elevation.

11. BASSUS SPIRACULARIS, new species

Very easily distinguished by the exceptionally large, almost slitlike, propodeal spiracles.

Female.—Length 9 mm. Face broader than long, finely punctate; malar space much less than half the eye height; third segment of labial palpi stout, not greatly reduced as in *texanus*, which species *spiracularis* closely resembles superficially; eyes large, attaining the vertex; a more or less prominent median ridge between the antennae; frontal impressions not margined; ocelli situated on a slight elevation above the rest of the vertex; ocell-ocular line about twice as long as the diameter of an ocellus; antennae long, tapering gradually to the apex, 51-segmented in the type; scape stout, distinctly shorter than the first flagellar segment; pronotal pits large and deep, margined by sharp carinae; parapsidal furrows strongly impressed, smooth or weakly foveolate; the middle mesonotal lobe prominent, with two faint median longitudinal impressions; furrow in front of scutellum broad and deep, with several pits usually distinctly separated; scutellum convex, polished, not margined at apex; propodeum areolated, the carinae except the transverse apical carina prominent; the median area long and narrow, sometimes confluent with the petiolarea; propodeal spiracle very large, nearly slitlike, and much less than its length from the anterior margin of the propodeum; propleura polished with a few oblique rugae anteriorly; mesopleura polished; mesopleural furrow coarsely foveolate; metapleura polished, somewhat rugose below; posterior legs slender; inner spur of hind tibia a little less than half the basitarsus; apical segment of the posterior tarsi slightly

shorter than the third; radius arising from about the middle of the stigma; areolet small, triangular, petiolate or subpetiolate; first abscissa of mediella much shorter than the second; nervellus not angled; abdomen as long as the head and thorax combined, entirely polished; the first tergite usually a little longer than broad at apex and provided with two prominent dorsal longitudinal keels which extend to the middle of the tergite or a little beyond, the area between these shallowly excavated; second tergite much broader than long; ovipositor sheaths about as long as the abdomen or very slightly longer. Head black, with a narrow reddish postorbital line; thorax black, the metapleura and propodeum usually red; anterior and middle legs black or blackish, the anterior tarsi brownish; posterior coxae and femora red, their trochanters, more or less of their tibiae, and their tarsi black; wings deeply infumated; abdomen red.

Type.—Cat. No. 28682, U.S.N.M.

Type locality.—Kanawha Station, West Virginia.

Described from two female specimens collected by S. A. Rohwer. In addition to the types the National Museum has a considerable number of specimens from a wild range of localities, including points in Virginia, Maryland, New Jersey, Pennsylvania, North Carolina, Ohio, Kentucky, Georgia, Texas, Nevada, and Washington. I have also seen four specimens from Illinois in the collection of the University of Illinois and a single specimen in the collection of the Boston Society of Natural History from Cambridge, Massachusetts (C. W. Johnson).

12. BASSUS SIMILLIMUS (Cresson)

Microdus simillimus CRESSON, Canad. Ent., vol. 5, 1873, p. 51.

Type.—No. 1772, Academy of Natural Sciences, Philadelphia, Pennsylvania.

This species is easily distinguished by the group of characters given in the key. There is a greater variation in size than is found in most species, specimens varying from 3.5 to 8 mm. occuring among the large amount of material examined. Face short and broad, much broader than long to the apex of clypeus; third segment of labial palpi very short, sometimes indistinct; cheeks broad, not strongly receding; temples full, but not bulging; frontal impressions very shallow; antennae usually 32 to 38 segmented, varying with the size of the specimen; parapsidal furrows impressed and nearly always distinctly foveolate; furrow in front of scutellum with several distinctly separated pits; propodeum rugose, not areolated, but usually with two median carinae that converge both anteriorly and posteriorly and set off a long narrow median area; dorsal aspect of propodeum usually long and only very slightly declivous; mesopleural foveolate; inner spur of hind tibia considerably less than half

the basitarsus; second cubital cell rather small, obliquely triangular, petiolated; radial cell very narrow; first abscissa of mediella always distinctly longer than the second; nervellus strongly angled above the middle and emitting a distinct discoidella from this angle; first abdominal tergite usually more or less striate and provided with two dorsal longitudinal keels which are usually short and sometimes are very weak; remainder of the abdomen smooth and polished; ovipositor sheaths nearly as long as the body. Head and thorax black, with the propodeum and metapleura testaceous or ferruginous; anterior and middle legs black or blackish; posterior coxae, trochanters, and femora reddish testaceous, their tibiae blackish at apex and their tarsi blackish; wings strongly infumated; abdomen red.

The above notes are based on the following material: The type, which is from Pennsylvania, specimens from New York, New Hampshire, Maryland, Pennsylvania, Virginia, Massachusetts, District of Columbia, Ohio, Illinois, Georgia, New Jersey, Iowa, and South Dakota, in the United States National Museum, and considerable material, all from Illinois, in the collection of the University of Illinois.

Hosts.—There is one specimen in the National Museum reared by R. A. Cushman as a parasite of *Lixus scrobicollis* Boheman at Vienna, Virginia; and another labeled "Reared from Mordellid? gallery in the stem of ragweed, Sioux City, Iowa, C. N. Ainslie." Probably this species will be found to attack various lepidopterous and coleopterous larvae living in the stems of herbaceous plants.

13. BASSUS ATRIPES (Cresson)

Agathis atripes Cresson, Proc. Ent. Soc. Phila., vol. 4, 1865, p. 296.

Type.—No. 1731, Academy of Sciences, Philadelphia, Pennsylvania.

Very similar to *nigripes* and sometimes difficult to distinguish from that species. However, the antennae are decidedly longer, being usually 34 to 36 segmented; the parapsidal furrows, although weak, are nevertheless suggested and distinctly set off the middle mesonotal lobe from the rest of the scutum; the ridge between the antennae is apparently always more prominent in *atripes* and decends rather abruptly behind; and all the specimens I have seen have the legs entirely black, without even reddish marks on the anterior femora and tibiae.

Face as long as broad, rostriform; malar space about as long as the eyes; cheeks distinctly concave; third segment of labial palpi not greatly shortened, more than half as long as the fourth; frontal impressions immargined; vertex short; temples bulging somewhat; head hollowed out behind; scutellum not margined at apex; propodeum mostly smooth and shining, with a long narrow median area

that narrows to a point at each end; mesopleural furrow weakly impressed, polished; spurs of hind tibia of about equal length and less than half as long as the basitarsus; areolet triangular, petiolate; first abscissa of mediella a little shorter than the second; abdomen smooth and polished; the first tergite with two prominent dorsal longitudinal keels; second and third tergites broad, with more or less distinct transverse impressions; ovipositor sheaths nearly as long as the body. Head black; thorax ferruginous, usually with the collar, lower part of propleura, and the pro and meso pectus black; all legs completely black; wings rather strongly infumated; abdomen entirely red.

These notes are based on only a small number of specimens: The type, which is from Colorado, and seven specimens in the National Museum from Colorado and New Mexico. Additional material may show a wider range of variations than has been indicated.

14. BASSUS NIGRIPES (Cresson)

Agathis nigripes CRESSON, Proc. Ent. Soc. Phila., vol. 4, 1865, p. 297.
Agathis nigriceps PROVANCHER, Natural. Canad., vol. 22, 1895, p. 96.
Agathis wyomingensis VIERECK, Trans. Kans. Acad. Sci., vol. 19, 1905, p. 284.

Type.—The type of *nigripes* is in the Philadelphia Academy of Science; that of *nigriceps* is in the Museum of Public Instruction in Quebec, Canada; and that of *wyomingensis* is in the University of Kansas.

Although I have not seen the type of *nigriceps* Provancher, the orignal description and notes on the type made by S. A. Rohwer leave no reasonable doubt that it is *nigripes* Cresson. The type of *wyomingensis*, which I have studied, is certainly conspecific with that of *nigripes* in my opinion.

The species is exceedingly close to *atripes*, but is undoubtedly distinct and separable on the basis of the characters mentioned in the discussion of *atripes*.

Head characters essentially the same as in *atripes*, except as noted in the key; the antennae are distinctly shorter, very slender, and not tapering to the apex, the apical segments of the female antennae shortened; parapsidal furrows wanting, the mesonotal lobes not defined; propodeum mostly smooth and polished, with a long narrow median area that narrows at both ends; basal lateral areas usually weakly defined; apical lateral areas rarely indicated; mesopleural furrow shallow, polished; second cubital cell triangular, petiolate; abdomen polished, the first tergite with two prominent dorsal longitudinal keels extending to the middle or beyond; ovipositor sheaths nearly as long as the body. Head black, the temples and cheeks and part of the face sometimes more or less ferruginous; thorax yellowish ferruginous, with the pro and meso pectus and part of the

propodeum more or less black or blackish; rarely the thorax is entirely testaceous; the duskiness or blackish coloring of propodeum usually restricted to the basal two-thirds, rarely covering entire propodum; wings infumated; legs usually black, often more or less varied with ferruginous, and in all the specimens examined the anterior femora are pale toward the apex, even when the legs are otherwise completely black; abdomen ferruginous.

The following material was studied and served as a basis for the above notes: The types of *nigripes* and *wyomingensis*, which are from Colorado and Wyoming, respectively; one specimen, in the collection of the Boston Society of Natural History, from Cohasset, Massachusetts; and 21 specimens, in the United States National Museum, which are from Colorado, Nevada, Washington, Oregon, California, New Mexico, Arizona, Kansas, and Rhode Island.

15. BASSUS BAKERI, new species

Most similar to *perforator*, but distinguished by the nearly hyaline wings, the much smoother propodeum, and the completely polished abdomen.

Female.—Length, 5 mm. Face subrostriform, smooth and shining; the malar space about three-fourths the eye height; clypeus strongly convex; third segment of labial palpi not greatly reduced, nearly as long as the second; frons polished, immargined; ocell-ocular line twice as long as the diameter of an ocellus; antennae slender, those of the type 25-segmented, the 10 apical segments quadrate, not longer than broad; mesoscutum smooth and polished; parapsidal furrows feebly indicated; furrow in front of scutellum deep, polished, divided into two pits by a median septum; mesopleural furrow very shallowly impressed, short, polished; metapleura mostly smooth, roughened only below; propodeum mostly smooth, not areolated, but with a short basal median carina which divides to form a broad areola that is open behind; petiolarea and lateral areas not at all defined; propodeum rounded anter-posteriorly; propodeal spiracles short oval; coxae polished; spurs of hind tibiae of apparently equal length and less than half as long as the basitarsus; apical segment of posterior tarsi about as long as the third; radius arising from the middle of the stigma; first abscissa of radius very short; first abscissa of mediella indistinctly shorter than the second; discoidella not distinct; abdomen about as long as the head and thorax combined; first tergite narrow at base, longer than broad at apex, and completely polished, with two short dorsal longitudinal keels that do not extend quite to the middle of the tergite; second tergite with a delicate, smooth, transverse furrow; suture between second and third tergites smooth; ovipositor sheaths as long as the body. Head and thorax entirely black; all coxae and trochanters, anterior femora basally, and the middle

and posterior femora entirely, black; tibiae varying from brown to blackish; all tarsi black or blackish; abdomen red; the first tergite black except at apex; wings only very faintly dusky, nearly hyaline.

Type.—Cat. No. 28684, U.S.N.M.

Type locality.—Colorado.

Described from two female specimens labeled "Colo. 2030, Collection C. F. Baker."

16. **BASSUS CRASSICORNIS**, new species

Most similar to *atripes*, but readily separated by the shorter antennae, the coarsely areolated propodeum, the wrinkled first tergite, and by the deeper red coloring of the thorax.

Female.—Length, 8 mm. Face long, rostriform, broadly elevated down the middle; malar space about equal to the eye height; clypeus long, nearly as long as the distance between the clypeal foveae, strongly transversely convex; the third segment of labial palpi about as long as the fourth; labrum large; frons polished, immargined; ocell-ocular line not more than one and one-half times the diameter of an ocellus; antennae 29-segmented in type, stout, tapering rather strongly to the tip, and but little longer than the head and thorax combined; the first flagellar segment longer than the scape, about three times as long as broad; the 10 or 12 apical segments only very little longer than broad; thorax stout, parapsidal furrows very weakly indicated, the lobes not prominent; the hind angles of mesoscutum produced into vertically compressed rounded lobes that are rather prominent; prepectal carina strong; prepectus descending abruptly; mesosternum scarcely longer than broad; mesopleural furrow broadly impressed but not at all foveolate; propodeum sloping gradually and only slightly, rather regularly areolated, the elevated lines prominent; propodeal spiracles short oval; metapleura smooth, rugose below; inner spur of hind tibia a little longer than the outer but less than half the basitarsus; apical segment of hind tarsi longer than the third; second cubital cell triangular, petiolate; first abscissa of mediella at least as long as the second; abdomen broadly sessile; first tergite fully as broad at apex as long, longitudinally wrinkled, and with two prominent dorsal longitudinal keels on the basal half; second tergite longer than the third and with a more or less distinct curved transverse impression, polished, the impression sometimes more or less foveolate; ovipositor sheaths about as long as the body. Head, including antennae and palpi, black; pro and meso pectus, tegulae, and wing bases black; remainder of thorax deep red; all legs black, immaculate; wings very deeply infumated; abdomen red.

Type.—Cat. No. 28683, U.S.N.M.

Type locality.—Gulfport, Florida.

Described from two female specimen labeled "Gulfport, Fla., 6–II." The paratype differs from the type only in having 30-segmented antennae and in having the mesopectus red.

17. BASSUS PERFORATOR (Provancher)

Agathis perforator Provancher, Natural. Canad., vol. 12, 1880, p. 177, no. 3.
Agathis femorator Provancher, Natural. Canad., vol. 12, 1880, p. 177, no. 4.
Bracon (*Agathis*) *sassacus* Viereck, Bull. 22, Conn. Geol. and Nat. Hist. Survey, 1917 (1916), pp. 230 and 231.
Bracon (*Agathis*) *branfordensis* Viereck, Bull. 22, Conn. Geol. and Nat. Hist. Survey, 1917 (1916), pp. 230 and 231.

Type.—The types of *perforator* and *femorator* are in the Museum of Public Instruction at Quebec, Canada; those of *sassacus* and *branfordensis* are in the collection of the agriculture experiment station at New Haven, Connecticut.

The types of *sassacus* and *branfordensis* which I have studied, are conspecific in my opinion; they were originally seperated on the basis of slight color differences, which are of no consequence. Unfortunately I have not seen the types of *femorator* and *perforator;* but from the original descriptions and notes on the types by S. A. Rohwer, and also from specimens compared with the types and determined as these species by Mr. Rohwer, it appears that they are not specifically distinct, and that they are in all probability the same as *sassacus* and *branfordensis.* Since *perforator* has line precedence over *femorator*, it is the valid name.

The material examined indicates that the species is most closely related to *nigripes*, but the basal abominal tergites are nearly always more or less sculptured; the propodeum is usually more completely aerolated; the parapsidal grooves are faintly indicated; and the thorax is generally darker, especially on the mesonotum; in size *nigripes* averages a little larger. The face is more or less lengthened being subrostriform, with the malar space rather long; antennae in the the material studied varying from 25 to 29 segmented, slender, not tapering to the apex; frons smooth, immargined; mesonotal lobes very faintly defined, the parapsidal grooves almost wanting; propodeum usually very faintly punctate and nearly completely aerolated with a long narrow median area and with the basal lateral and apical lateral areas nearly always distinct; mesopleural furrow smooth; second cubital cell triangular, with a short petiole; first abcissa of mediella about as long as the second; first abdominal tergite with two prominent dorsal longitudinal keels and more or less finely punctured or striato-punctate; second and third tergites often finely closely sculptured; ovipositor sheaths nearly as long as the body. Head black, often more or less varied with ferruginous; thorax varying from entirely black to almost entirely ferruginous; usually the thorax is black with the mesopleura and the metapleura mostly pale, but

all intergrades from entirely black to nearly entirely ferruginous occur; wings a little infumated; anterior and middle legs usually mostly black, the femora and tibiae often somewhat marked with reddish; posterior legs varying from almost entirely black to mostly ferruginous, most frequently being black, with the femora pale.

The above discussion is based on National Museum material from Canada, New York, Massachusetts, New Hampshire, Michigan, Wisconsin, South Dakota, and the District of Columbia; and several specimens in the collection of the Boston Society of Natural History, from Massachusetts and New Hampshire. This material exhibits unusual variability, both in color and sculpture, and I am not entirely satisfied that only one species is concerned; but the presence of practically all intergrades seems to indicate that this is the case.

18. BASSUS CALCARATUS (Cresson)

Microdus calcaratus Cresson, Canad. Entom., vol. 5, 1873, p. 51.

Type.—In the Philadelphia Academy of Sciences.

A rather common species, which appears to be very constant in color markings. Face broader than long; clypeus broad and only slightly convex; third segment of labial palpi very short, usually indistinct; malar space short, rarely more than one-fourth the eye height; temples rather narrow, gradually receding; frontal impressions not deep, immargined; antennae 34 to 40 segmented; parapsidal furrows sharply impressed, sometimes weakly foveolate anteriorly; middle mesonotal lobe strongly elevated anteriorly; furrow in front of scutellum smooth, not distinctly pitted; pleura polished; mesopleural furrow short, rather weak, smooth; propodeum nearly always completely aerolated, the carinae prominent, the areas usually smooth within; second cubital cell triangular, usually shortly petiolate, the petiole nearly always distinctly shorter than the first abscissa of radius; first abscissa of mediella distinctly shorter than the second; nervellus not angled; abdomen polished; the first tergite with two prominent dorsal longitudinal keels; second and third tergites each with a more or less distinct transverse impressed line which is often weakly foveolate; suture between these two tergites also sometimes foveolate in part; ovipositor sheaths nearly as long as the body. Head black; thorax black, with propodeum and metapleura red; wings rather strongly infumated, the hind wing with the area behind the mediella more or less hyaline; anterior and middle legs black, their tarsi sometimes pale; posterior coxae and femora red; posterior trochanters, tibiae, and tarsi black; abdomen entirely red; length usually 4.5 to 6 mm.

The following material has been examined in the course of this study: The type, which is from Delaware; two specimens from Edgartown, Massachusetts, in the collection of the Boston Society

of Natural History; considerable material in the United States National Museum consisting of collected specimens from New York, New Hampshire, Virginia, Maryland, Massachusetts, and Texas; one specimen reared at Monticello, Florida, from *Psilocorsis*, new species, under Quaintance No. 10577; 11 specimens reared under Gipsy Moth Laboratory No. 12101, from *Acrobasis caryivorella* Ragonot, taken in Wakefield and Maynard, Massachusetts, and Manchester, Connecticut; and three specimens from Kenduskeag and Bangor, Maine, reared from *Acrobasis betulella* Hulst, under Gipsy Moth Laboratory No. 12406; and at the Gipsy Moth Laboratory, at Melrose Highlands, Massachusetts, a large series of specimens reared from *Acrobasis caryivorella* and *A. betulella* taken at various points in Massachusetts, New Hampshire, Maine, and Connecticut.

19. BASSUS USITATUS Gahan

Bassus usitatus Gahan, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 119.

Type.—In the United States National Museum.

Very similar to *calcaratus* and *difficilis*, the three species being exceedingly close; *usitatus*, judging by the two known specimens, appears to differ from the other two species in having the second cubital cell much more strongly petiolate, the petiole being distinctly longer than the first radial abscissa; it differs further from *calcaratus* in possessing red hind trochanters and in the more uniformly dusky hind wings, and from *difficilis* in the pale apical segment of all tarsi; the value of this last character, however, is doubtful, for in *calcaratus* the apical tarsal segment varies more or less in color, and this may prove to be true in *usitatus* and *difficilis*. Aside from the differences just noted, the characterization of *calcaratus* given above in the discussion of that species will apply to *usitatus*.

Known only from the two type specimens, which were reared from *Mineola vacinii* Riley at East Wareham, Massachusetts.

20. BASSUS DIFFICILIS, new species

Distinguishable from *usitatus* and *calcaratus*, its nearest allies, by the characters noted in the key and in the discussion of *usitatus*.

Female.—Length, 7.5 mm. Face rather flat, at least as broad as long, smooth; clypeus broad, nearly flat; malar space less than one-third the eye height; eyes large, broad; labial palpi short, the third segment minute, sometimes not distinct; temples not broad, receding gradually; frons polished, immargined; ocell-ocular line in the female about twice, in the male less than twice, the diameter of an ocellus; antennae of type 41 segmented; the first flagellar segment not longer than the scape; pronotal pits not margined by carinae; parapsidal furrows sharply impressed, smooth, or only weakly foveolate anteriorly; middle mesonotal lobe prominently elevated anteriorly; furrow in

front of scutellum smooth; propodeum regularly areolated, the carinae prominent, the areas usually smooth; mesopleural furrow shallow, smooth, and polished; radius arising from about the middle of the stigma; areolet triangular, subsessile or with a short petiole; nervulus very slightly postfurcal; first abscissa of mediella distinctly shorter than the second; inner spur of hind tibia a little longer than the outer and less than half the basitarsus; abdomen as long as the head and thorax combined; first tergite a little longer than broad at apex, with two prominent dorsal keels on the basal half; abdomen entirely polished, with only the transverse impressions on the second and third tergites, and the suture between these tergites, sometimes weakly foveolate; ovipositor sheaths distinctly a little shorter than the body. Head black; palpi blackish basally; thorax black, with the propodeum and metapleura usually red, rarely somewhat blackish; anterior and middle legs black; posterior coxae, trochanters, and femora red, their tibiae and tarsi black; wings deeply infumated; abdomen entirely red.

Male.—Length, 5 mm.; antennae of allotype 34-segmented; otherwise like the type; the anterior and middle tarsi of the male are sometimes pale.

Type.—Cat. No. 28686, U.S.N.M.

Type locality.—Palm Beach, Florida.

Described from five females and two males collected by Dr. H. G. Dyar at Palm Beach, Florida. In addition to the type series I have seen two specimens, collected by S. S. Crossman, at Inverness, Florida, which are at the Gipsy Moth Laboratory, Melrose Highlands, Massachusetts.

21. BASSUS TENUICEPS, new species

Differs from related species in combining the absence of parapsidal grooves with unusually narrow temples, a nonrostriform face, prominent dorsal longitudinal keels on the first tergite, and entirely yellowish legs.

Female.—Length, 6 mm. Head thin antero-posteriorly, the temples very narrow, strongly receding; face rather flat, smooth, a little broader than long; clypeus broad, only slightly convex; labrum short and broad; third segment of labial palpi minute; eyes moderately large; malar space about half the eye height; frons polished, immargined; ocelli large; ocell-ocular line about one and one-half times the diameter of an ocellus; head only slightly, broadly hollowed out behind; antennae 32-segmented in the type, slender; pronotal pits small, poorly defined; mesonotum polished; parapsidal furrows wanting; furrow in front of scutellum with several distinctly separated pits; propodeum more or less distinctly areolated, the carinae not very prominent, the areas rugulose; propodeal spiracle small, oval;

peural entirely polished; mesopleural furrow shallow, poorly defined, smooth; coxae smooth and polished; inner spur of hind tibia not distinctly longer than the outer, nearly half as long as the basitarsus; radius arising from the middle of the stigma; areolet triangular, strongly petiolate; first abscissa of mediella just about equal to the second; nervellus straight; discoidella wanting; first abdominal tergite a little longer than broad at apex, more or less striate medially and with two prominent dorsal longitudinal keels on the basal two-thirds; second and third tergites polished, the second with a nearly straight transverse impression which is foveolate; the suture between second and third tergites and the curved transverse furrow on the third also foveolate; ovipositor sheaths about as long as the body. Head, thorax, and abdomen of type uniformly testaceous; palpi pale yellow; antennae black; legs entirely testaceous, except the apex of hind tibiae and the hind tarsi, which are blackish; wings weakly infumated.

Male.—Essentially like the female; the anterior and middle trochanters and the extreme base of their femora a little blackish; the posterior tibiae mostly brownish black.

Type.—Cat. No. 28687, U.S.N.M.

Type locality.—Wild Horse Canyon, Animas Mountains, Arizona.

Allotype locality.—Globe, Arizona.

Described from one female and one male. The allotype was taken on *Thurberia thespesioides* by C. H. T. Townsend.

22. BASSUS NINANAE, new species

Most similar to *bicolor,* but at once distinguished by the long, not rounded, mostly smooth, dorsal face of propodeum; the thorax is a little more slender and the pleura more conspicuously pilose than in *bicolor;* furthermore, in the latter species the propodeum is rarely red, and then the thorax is practically entirely red; while in *ninanae,* the propodeum is usually reddish, though the pleura and pectus are black; the ovipositor sheaths are a little longer in *ninanae,* being as long as the thorax and abdomen combined.

Female.—Length, 6.2 mm. Face broader than long from antennal foramina to apex of clypeus, rather densely pilose, malar space fully as long as the second segment of antennal flagellum; temples not broad, gradually receding; frontal impressions immargined; ocell-ocular line not distinctly twice as long as the diameter of an ocellus; antennae very slender, 36-segmented in the type; mesoscutum rather long and narrow; the parapsidal furrows weakly indicated, polished; furrow in front of scutellum with several distinctly separated pits; propodeum mostly smooth, only slightly roughened down the middle, not areolated, and with a more or less distinct apical transverse carina setting off the short, abruptly descending,

posterior face from the long, rather flat, dorsal face; pleura polished, rather strongly pilose; mesopleural furrow weakly impressed, not foveolate; posterior coxae smooth, pubescent; posterior femora rather short and stout; spurs of hind tibiae apparently of equal length and shorter than half the hind basitarsus; last segment of hind tarsi not longer than the third; second cubital cell small, triangular, petiolated; radius arising from about middle of stigma; first abscissa of mediella about as long as the second or indistinctly shorter; nervellus straight; discoidella very weak, obsolete at base; abdomen slender; first tergite a little longer than broad at apex, with two prominent dorsal longitudinal keels extending from the base to the apical third, and usually with a few weak longitudinal striae between these keels; second and following tergites polished; ovipositor sheaths very nearly as long as the body. Ferruginous; head black, with clypeus, middle of face, cheeks, and temples often more or less reddish; mesonotum and propodeum ferruginous, sometimes more or less infuscated or blackish; propleura and metapleura usually ferruginous or fuscous, the mesopleura black; pro and meso pectus black; anterior and middle legs brownish black, the coxae and trochanters darkest; hind coxae and trochanters brownish black; their femora testaceous; posterior tibiae and tarsi brown; wings infumated; abdomen entirely ferruginous.

Male.—Essentially as in the female; but the thorax is darker, being entirely black except for ferruginous markings in the region of the parapsidal grooves.

Type.—Cat. No. 28688, U.S.N.M.

Type locality.—Huachuca, Arizona.

Host.—*Carpocapsa ninana* Riley.

Described from three female, and one male, specimens reared from the above host, June 20–27, 1883, under Bureau of Entomology No. 2711.

23. BASSUS ACROBASIDIS Cushman

Bassus acrobasidis CUSHMAN, Proc. U. S. Nat. Mus., vol. 58, 1920, p. 289.

Type.—In the United States National Museum.

Exceedingly similar to *erythrogaster*, and sometimes very difficult to distinguish from that species. However, the characters given in the key will nearly always separate them readily.

Face broader than long to the apex of clypeus; malar space usually a little longer than in *erythrogaster;* antennae distinctly longer, usually 32 to 36 segmented, rarely in very small specimens with 31 segments; the apical flagellar segments in the female slender, elongate; third segment of labial palpi short but distinctly longer than broad, not as in *calcaratus* and allied species; parapsidal furrows

very weak anteriorly, a little more pronounced posteriorly and uniting to form an elongate polished impression that is more pronounced than in *erythrogaster;* furrow in front of scutellum foveolate; propodeum rugulose, sometimes more or less distinctly areolated; mesopleural furrow shallow, smooth; areolet of anterior wing usually decidedly petiolate; first abscissa of mediella about as long as the second; first abdominal tergite more or less longitudinally striate or wrinkled and with two prominent dorsal keels; the transverse furrows on second and third tergites and the suture between the two usually more or less foveolate; ovipositor sheaths about two-thirds as long as the body. Head black, sometimes more or less reddish below; thorax black, with propodeum and metapleura and sometimes part of pro and meso pleura red; the propodeum rarely partly blackish; wings infumated; anterior and middle legs mostly black or blackish; posterior coxae, trochanters and femora red, the trochanters very rarely a little fuscous in small male specimens; posterior tibiae usually red, black at apex, but sometimes mostly dark reddish brown; hind tarsi black; abdomen red. Length, usually about 4 to 6 mm.

In addition to the type series the National Museum has a series of six specimens, which were reared from *Acrobasis*, species, at Brownsville, Texas, under Quaintance Nos. 16981, 16994, 16995 16996, 16997; and nine specimens recorded as parasitic on *Acrobasis caryivorella* Ragonot at College Station, Texas (S. W. Bilsing).

24. BASSUS ERYTHROGASTER Viereck

Bassus (*Aerophilopsis*) *erythrogaster* VIERECK, Proc. U. S. Nat. Mus., vol. 44 1913, p. 555.

Type.—In the United States National Museum.

Very close to *acrobasidis*, but certainly distinct, and separable by the differences pointed out in the above discussion of that species. In the specimens examined the antennae vary from 27 to 29 segmented, and in the female the apical segments are usually less slender than in *acrobasidis;* the parapsidal furrows are distinctly a little sharper anteriorly than posteriorly, and the posterior impression formed by their union is very shallow and not so well marked as in *acrobasidis;* the propodeum is usually more or less distinctly aerolated, the areas somewhat roughened; mesopleural furrow very shallow, polished; metapleura smooth; areolet of anterior wing triangular, usually with a very short petiole; the two abscissae of mediella about equal; abdomen as described for *acrobasidis*; ovipositor sheaths two-thirds to three-fourths as long as the body. Head and thorax black, with usually the metapleura in part, and rarely more or less of propodeum, red; only very rarely are metapleura and propodeum entirely red; wings infumated; legs as in *acrobasidis*, except that the hind tibiae are nearly always black; abdomen red.

The above observations are based on the following material: Five specimens constituting the type series; 37 additional specimens in the United States National Museum from Vienna, Virginia; Champaign, Illinois; Caney Spring, Tennessee (reared from lepidopterous larva in ragweed stem by G. G. Ainslie); Hagerstown, Maryland (from ragweed stem); Kansas; New York; Alabama; Georgia; Leesburg, Virginia; and Tallulah, Louisiana; and three specimens from Illinois, in the collection of the University of Illinois.

25. BASSUS BUTTRICKI Viereck

Bassus (*Lytopylus*) *buttricki* VIERECK, Bull. 22, Conn. Geol. and Nat. Hist. Survey, 1917 (1916), pp. 228 and 229.

Type.—In the agricultural experiment station at New Haven, Connecticut.

Most similar to *bicolor*, but nearly always readily distinguished by the characters given in the key; the antennae are distinctly shorter; the second abdominal tergite is very often closely striate on the basal half or more, this striate condition sometimes extending upon the third tergite as well; and the color variation of the thorax is not in the same direction as in *bicolor*. In a series of specimens of *bicolor* showing all gradations from an entirely black to an entirely red thorax the first reddish markings appear on the mesonotum and then gradually take in the pleura, leaving the pectus and the propodeum as the last parts to become red; in *buttricki*, on the other hand, the reddish coloring being at the propodeum and metapleura, and then extends to the mesopleura, mesopectus, and propleura, leaving the mesoscutum always black or blackish. Face distinctly broader than long; malar space about half the eye height; antennae varying in the material studied from 23 to 27 segmented; pronotal pits small; propleura polished, but with several distinct foveae just below the pronotal pits; mesopleural furrows very weak, smooth; mesoscutum only very weakly, sometimes indistinctly impressed medially behind the union of the parapsidal furrows; furrow in front of scutellum pitted; propodeum more or less areolated, but the areas usually poorly defined and rugulose within; mesopleural furrow shallow, polished; areolet of fore wing triangular, petiolate; the two abscissae of mediella of about equal length; first abdominal tergite more or less striate and with two prominent dorsal keels on the basal two-thirds; second tergite usually somewhat striate, occasionally completely so; third tergite often striate basally; ovipositor sheaths about as long as the body. Head black, the face in the palest specimens sometimes mostly ferruginous; thorax very rarely entirely black, the metapleura and propodeum at least being usually red; sometimes the entire thorax except the mesonotum is red; wings fuscous; anterior and middle legs black or brownish black; posterior

legs usually mostly black, but both their coxae and their femora vary from almost entirely red to completely black; abdomen red. Length, usually 3.5 to 5 mm.

In addition to the type, which is from Connecticut, I have seen two specimens in the collection of the Boston Society of Natural History, from Fort Kent, Maine and Mount Greylock, Massachusetts; and the following material in the National Museum collection: Fourteen specimens reared from larvae of *Isophrictis*, species in flowers of *Rudbeckia hirta*, at Liberty, Texas, by L. J. Bottimer; three from *Isophrictis*, species in flowers of *Rudbeckia maxima*, at Liberty, Texas; and collected specimens from Colorado; South Dakota; Georgia; Leesville, Louisiana; Glen Echo, Maryland; and Harpers Ferry, West Virginia.

26. BASSUS BICOLOR (Provancher)

Microdus bicolor PROVANCHER, Natural. Canad., vol. 12, 1880, p. 179.

Type.—In the Museum of Public Instruction at Quebec, Canada.

The close resemblance of this species to *buttricki* and the more important differences between the two are discussed above under *buttricki.*

Face distinctly broader than long to the apex of clypeus; malar space half, or more than half, as long as the eyes; third segment of labial palpi small, but slender and distinctly longer than broad; antennae of the specimens examined varying from 29 to 33 segmented; parapsidal furrows very weak, smooth; a slightly more distinct median impression posteriorly on mesoscutum than is found in *buttricki*; furrow in front of scutellum foveolate; mesopleural furrow shallow, smooth; propodeum usually rugulose and most frequently more or less distinctly areolated, although sometimes the areas are not at all distinctly defined; areolate of anterior wing triangular, small, strongly petiolate, the petiole usually longer than the first abscissa of radius; first and second abscissae of mediella about equal; first abdominal tergite more or less striate and with two prominent dorsal longitudinal keels extending to the apical third; tranverse impressions on the second and third tergites, and the suture between the two tergites usually crossed by numerous short striae; ovipositor sheaths about two-thirds as long as the body, distinctly shorter than in *buttricki.* Head black, very rarely, in exceptionally pale specimens, with the face mostly ferruginous; thorax usually mostly black, but varying to entirely ferruginous, the mesonotum being the first part to become pale and the propodeum the last, the propodeum being very rarely ferruginous; wings infumated; anterior and middle legs black or blackish; posterior legs black with the femora usually red or rufous; rarely, in very pale specimens, the hind coxae more or less ferruginous, abdomen ferruginous, the first tergite often black basally in the darker specimens.

The above notes are from the following material: Twenty specimens in the United States National Museum from Ottawa, Ontario; St. John, New Brunswick; Massachusetts; New Hampshire; Bar Harbor and Mount Desert, Maine; Long Island, New York; Harrisburg, Pennsylvania; Vienna, Virginia; and Washington, District of Columbia (reared from *Eucosma desertana* Zeller under Bureau of Etomology No. 3212); and eight specimens in the collection of the Boston Society of Natural History, which are from Gloucester, Provincetown, Cohasset, and Newton, Massachusetts; Mount Washington, New Hampshire; and Mount Desert, Eastport, and Bar Harbor, Maine.

27. BASSUS LATICEPS, new species

Very close to *terminatus*, but separated from that species without difficulty by means of the characters included in the key.

Female.—Length, 5 mm. Head transverse, broad, broader than the thorax, rather strongly hollowed out behind; face very much broader than long; eyes rather small, not reaching the vertex; temples and cheeks broad and bulging distinctly beyond the eyes; malar space about three-fourths the eye height; clypeus more or less elevated anteriorly; labrum large, rather long, rounded at apex; palpi slender; third segment of labial palpi not shortened, nearly as long as the fourth; frontal impressions immargined; ocelli small; ocell-ocular line more than three times the diameter of an ocellus; antennae slender, not tapering to the tip, 25-segmented in the type; scape rather long and slender; pedicel longer than broad; a broad, low, backwardly projecting triangular elevation between antennae; thorax rather stout; mesoscutum polished; parapsidal furrows sharply impressed, usually weakly foveolate; scutellum at least as broad as long, polished, indistinctly roughened at apex; propodeum weakly rugulose, with two more or less distinct, median carinae; posterior face of propodeum strongly declivous, the dorsal face rather short; propodeal spiracle very small, nearly round; pleura polished; mesopleural furrow straight, sharply impressed, usually finely foveolate; coxae polished; posterior coxae broad and a little shorter than the first tergite; posterior tibiae with a rather conspicuous backwardly projecting flange at apex bearing three or four short blunt spines; spurs of hind tibiae short, the inner spur only about one-third the basitarsus; posterior basitarsus distinctly less than half the hind tibiae; last segment of hind tarsus a little shorter than the second but longer than the third; areolet of fore wing triangular, usually shortly petiolate; first abscissa of mediella a little longer than the second; nervellus usually angled above the middle and emitting a distinct discoidella from this angle; first abdominal tergite about as broad at apex as long, polished, without two dorsal longitudinal keels; remainder of abdomen also

polished, the second tergite with only a faint suggestion of a transverse impression; ovipositor sheaths fully as long as the body. Color uniformly ferruginous, with antennae and palpi black, propodeum sometimes more or less black; anterior and middle trochanters, sometimes their femora basally, all tibiae at apex, and all tarsi, blackish; wings a little infumated.

Type.—Cat. No. 28690, U.S.N.M.

Type locality.—Arizona.

Described from eight female specimens labeled "Ariz. 2122, Collection C. F. Baker." The National Museum also has one male specimen, not included in the type series, which is from Takoma, District of Columbia.

28. BASSUS TERMINATUS (Cresson)

Microdus terminatus CRESSON, Proc. Ent. Soc. Phila., vol. 4, 1865, p. 298.
Orgilus terminalis ASHMEAD, Proc. U. S. Nat. Mus., vol.11, 1889 (1888), p. 640.

Type.—The type of *terminatus* in the collection of the Philadelphia Academy of Science; that of *terminalis* is in the United States National Museum.

There seems to be no basis on which to separate *terminalis* from *terminatus*, and I believe they are the same species. The characters given in the key will readily distinguish this species from *laticeps*, which is apparently its nearest relative.

Face broader than long; temples not bulging so strongly as in *laticeps* and not nearly as broad as in that species; eyes a little larger and extending to the vertex; malar space about two-thirds as long as the eyes; clypeus not elevated anteriorly; labrum a little shorter than in *laticeps;* third segment of labial palpi shortened but longer than broad; antennae slender, usually 29 to 31 segmented; the first flagellar segment four times as long as broad and longer than the scape and pedicel combined; parapsidal furrows sharply impressed and finely foveolate; furrow in front of scutellum with several pits; propodeum closely rugulose; hind femora rather stout; mesopleural furrow straight, foveolate; inner spur of hind tibia longer than the outer but less than half the basitarsus; posterior basitarsus distinctly longer than half the hind tibia; apical segment of hind tarsi about as long as the third; posterior tibiae short, thickened at apex, with a group of 10 or more short stout spines above the outer terminal spur; areolet of fore wing triangular, petiolate; first abscissa of mediella distinctly longer than the second; nervellus angled above the middle and emitting a distinct discoidella from this angle; first abdominal tergite broad, closely finely striate, but without prominent dorsal keels; second and following tergites polished; ovipositor sheaths distinctly shorter than the body. Ferruginous; antennae black;

propodeum and pectus usually, and in the male sex the apical abdominal tergites, blackish; wings somewhat infumated; legs ferruginous, with the anterior and middle coxae, all trochanters, apex, and an annulus near base of hind tibiae and the hind tarsi black or blackish.

In addition to the types, both of which are from Colorado, I have seen only four specimens, which are in the National Museum. These specimens are from Colorado and Oklahoma.

29. BASSUS GIBBOSUS Say

Bassus gibbosus SAY, Boston Journ. Nat. Hist., vol. 1, 1836, p. 250.
Microdus pygmaeus CRESSON, Trans. Amer. Ent. Soc., vol. 4, 1872, p. 182.
Agathis scrutator PROVANCHER, Addit. faun. Canad. Hymen., 1886, p. 137.
Agathis dispar PROVANCHER, Addit. faun. Canad. Hymen., 1886, pp. 137 and 138.
Microdus meridionalis VIERECK, Trans. Amer. Soc., vol. 29, 1903, pp. 95 and 96.
Microdus wichitaensis VIERECK, Trans. Kans. Acad. Sci., vol. 19, 1905, p. 276.
Microdus castaneicinctus VIERECK, Trans. Kans. Acad. Sci., vol. 19, 1905, p. 276.

Type.—Say's type is probably lost; Cressons's type of *pygmaeus* is in the United States National Museum;[15] that of Viereck's *meridionalis* is in the Philadelphia Academy of Science; those of *scrutator* and *dispar* are in the Museum of Public Instruction at Quebec, Canada; and those of *wichitaensis* and *castaneicinctus* are in the collection of the University of Kansas.

Although Say's type of *gibbosus* is not available there seems to be no reasonable doubt that the species here treated as *gibbosus* is what Say had before him. The types of *pygmaeus meridionalis*, *wichitaensis*, and *castaneicinctus*, all of which I have studied, certainly belong to the same species, and in my opinion are *gibbosus*. I have not seen the types of *scrutator*, and *dispar*, but the original descriptions, combined with notes on the types by S. A. Rohwer, seem to leave no doubt that they also are *gibbosus*.

The species is most similar to *tibiator*, but usually is not difficult to distinguish from that species. The face is nearly always distinctly shorter; the third segment of the labial palpi is relatively much smaller; the basal tooth of the tarsal claws is more strongly developed; the areolet is rarely broadly sessile; and the abdomen is nearly always much more strongly sculptured than in *tibiator*, and is often ferruginous on the second or third tergites or more.

Face distinctly transversely convex; clypeus convex; head strongly hollowed out behind; antennae slender, not tapering to the tip, and usually 22 to 28 segmented; the third segment of labial palpi very short and slender; parapsidal furrows sharply impressed, usually finely foveolate or punctate; propodeum usually more or less finely

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[15] Cresson, Mem. 1, Amer. Ent. Soc., 1916, p. 71, assigns type number 2747 to this species and records the type as being in the collections of the Philadelphia Academy of Sciences. The specimen in the Philadelphia Collection is, as Cresson indicates, a male and is the allotype. The holotype female is in the National Museum and has been given type number 1638. The head of the holotype is wanting.—S. A. ROHWER.

rugulose, sometimes mostly smooth, always with two median longitudinal carinae that diverge very slightly behind; mesopleural furrow minutely foveolate; first abdominal tergite broad, closely ruguloso-striate; second tergite usually mostly rugulose and with a curved transverse impression near the middle; third tergite sometimes partly sculptured; ovipositor sheaths about two-thirds as long as the body. Head and thorax black; wings slightly dusky to hyaline; all coxae and trochanters usually blackish, the remainder of the legs mostly brownish yellow; rarely, the coxae and trochanters more or less ferruginous; abdomen varying from entirely black to nearly entirely ferruginous. Length usually 2 to 4 mm.

The above discussion is based on a study of the types of *pygmaeus*, *meridionalis*, *wichitaensis*, and *castaneicinctus;* and a large amount of material in the National Museum, which includes collected specimens from Maryland, Texas, Colorado, Michigan, California, Virginia; New Mexico, Georgia, Kansas, Illinois, New York, Massachusetts, and Canada, and the following reared material: Eight specimens from *Phthorimaea glochinella* Zeller, at Baton Rouge, Louisiana (T. H. Jones); 7 reared from the same host, at the same locality, by J. L. E. Lauderdale under Chittenden No. 4268; 5 from *Phthorimaea operculella* Zeller, at Los Angeles, California (J. E. Graf); 2 from *Mompha stellella* at Riverton, New Jersey (H. B. Weiss); 10 from the same host at Washington, D. C. (A. Busck); 3 specimens reared from *Mompha*, species at Vienna, Virginia, under Quaintance No. 7187; and 1 labeled as reared from "*Gortyna nitela*" in Missouri.

30. BASSUS BREVICORNIS, new species

Very similar to *tibiator*, but distinguishable at once by the shorter antennae and the longer ovipositor. Although the smallest specimens of *brevicornis* are as large as the largest *tibiator*, the number of segments in the antennae is always smaller. The first tergite is usually more coarsely striate than in *tibiator*, the labrum is more strongly hairy, the wings somewhat more deeply infuscated, and the mesopleural furrow usually more coarsely foveolate; the last segment of the posterior tarsi scarcely as long as the third, while in *tibiator* it is usually longer.

Female—Length, 5.5 mm. Face very long; malar space usually longer than the eyes; face strongly convex down the middle line; clypeus very long; labrum rather large, closely hairy; palpi slender; third segment of labial palpi not shortened, nearly as long as the fourth; frons immargined; head strongly hollowed out behind; ocell-ocular line about one and one-half times as long as the diameter of an ocellus and not longer than the postocellar line; antennae short, 22-segmented in the type; scape not large; pedicel slightly longer than broad; flagellum slender, not tapering at all to

the apex; first flegellar segment decidedly longer than scape and pedicel combined and much longer than the second flagellar segment; the apical segments of flagellum short; thorax long and narrow; parapsidal grooves sharply impressed, finely foveolate; mesonotal lobes usually a little more elevated and polished than in *tibiator;* furrow in front of scutellum very broad in the middle, more or less pitted; scutellum longer than broad at base, slightly convex; propodeum mostly smooth, finely rugulose down the middle and along the sides, and with two complete median longitudinal carinae that meet at the base of propodeum and diverge gradually but very slightly to the apex; propodeal spiracles very small, nearly circular; pleura polished; mesopleural furrow usually broader and more coarsely foveolate than in *tibiator;* spurs of hind tibiae nearly equal in length, distinctly less than half the basitarsus; tarsal claws without a basal tooth; second cubital cell four-sided, the second abscissa of radius short but distinct; first abscissa of mediella a little longer than the second; nervellus angled and emitting a distinct discoidella from this angle; first abdominal tergite scarcely longer than broad at apex, closely, rather strongly striate, and without two dorsal longitudinal keels; remainder of abdomen polished, although the second tergite sometimes has some weak striae originating in the shallow transverse impression; ovipositor sheaths as long as the body. Head, thorax, and abdomen entirely black; wings strongly infumated; legs black, with anterior and middle femora at apex, and their tibiae mostly, brownish yellow; posterior tibiae broadly black at apex and with a black annulus near base, brownish at extreme base and on the middle; all tarsi black or blackish.

Male.—Agrees with the description of the female except for sexual characters. The antennae of the allotype are 23-segmented.

Type.—Cat. No. 28691, U.S.N.M.

Type locality.—Alameda Foothills, California.

Allotype locality.—Hayward, California.

Described from two female specimens collected at the type locality by W. M. Giffard, and one male collected by M. C. Lane. The female paratype has 23-segmented antennae.

31. BASSUS TIBIATOR (Provancher)

Agathis tibiator PROVANCHER, Natural. Canad., vol. 12, 1880, p. 177.
Agathis parvus VIERECK, Trans. Amer. Ent. Soc., vol. 29, 1903, p. 96.
Bracon (*Agathis*) *solidaginis* VIERECK, Bull. 22, Conn. Geol. and Nat. Hist. Survey, 1917 (1916), pp. 230 and 231.

Type.—The type of *tibiator* is in the Museum of Public Instruction at Quebec, Canada; that of *parvus* is in the Philadelphia Academy of Science; and that of *solidaginis* is in the agricultural experiment station at New Haven.

This species is very similar to *gibbosus* and *brevicornis*, but can be distinguished from both as pointed out in the above discussions of those species. Face elongate, narrow; malar space usually nearly as long as the eyes; palpi slender, as in *brevicornis*; antennae slender, usually 25 to 27 segmented; parapsidal furrows impressed, narrow, usually minutely foveolate; mesonotal lobes usually with scattered shallow punctures; propodeum about as in *brevicornis*; mesopleural furrow very narrow, minutely foveolate or punctate; second cubital cell usually distinctly four-sided, though very narrow above, on the radius; first abscissa of mediella longer than the second; abdomen mostly polished, the first tergite usually only faintly striate, the second sometimes very weakly sculptured in part; ovipositor sheaths about two-thirds as long as the body. Head, thorax, and abdomen black, very rarely the second tergite a little tinged with reddish; wings a little dusky, not deeply infumated; legs usually as described for *brevicornis*.

In addition to the types of *parvus* and *solidaginis*, I have seen considerable material in the United States National Museum, all collected specimens, from a wide range of localities, including St. John and Nerepis, New Brunswick; Hagerstown, Maryland; White River, South Dakota; Riley County, Kansas; West Point, Nebraska; Colorado; Arlington, Virginia; Easton, Washington; and Los Angeles, California; this collection also includes a homotype, determined by S. A. Rohwer, which is without locality data.

32. BASSUS ANNULIPES (Cresson)

Microdus annulipes Cresson, Canad. Ent., vol. 5, 1873, p. 53.

Microdus earinoides Cresson, Canad. Ent., vol. 5, 1873, p. 54.

Microdus grapholithae Ashmead, Proc. U. S. Nat. Mus., vol. 11, 1889 (1888), p. 639.

Microdus albocinctus Ashmead, Proc. U. S. Nat. Mus., vol. 11, 1889 (1888), p. 639.

Bassus waldeni Viereck, Bull. 22 Conn. Geol. and Nat. Hist. Survey, 1917 (1916), pp. 228 and 229.

Type.—The types of *annulipes* and *earinoides* are in the Philadelphia Academy of Science; those of *grapholithae* and *albocinctus* are in the United States National Museum; and that of *waldeni* is in the agriculture experiment station at New Haven, Connecticut.

A study of all of these types has convinced me that they represent but a single species. The unusually wide variations are doubtless responsible for the description of the species under so many names. The type of *earinoides*, which has the body practically entirely black, represents one extreme, while that of *grapholithae*, which is almost wholly testaceous, represents the other, and the types of *annulipes*, *albocinctus*, and *waldeni* fall between these extremes. The National Museum material of this species is rather extensive and contains a good series of intergrades.

The face is unusually short and broad; eyes short oval, broad; malar space short; third segment of labial palpi very small, transverse, sometimes indistinct; temples with a conspicuous bulge, or broad rounded tubercle opposite the middle of the eyes; ocell-ocular line less than twice the diameter of an ocellus and not greater than the postocellar line; antennae long and slender, from 32 to 40 segmented; thorax rather long and narrow; parapsidal furrows sharply impressed and foveolate; the middle mesonotal lobe narrow and somewhat elevated; scutellum small, more or less distinctly carinately margined at the apex; propodeum rugoso-reticulate, with two usually prominent, slightly curved median carinae down the middle that converge toward the base and also toward the apex, inclosing a long median area that extends the length of the propodeum; mesopleural furrow narrow, usually finely foveolate; areolet of fore wing triangular, oblique, petiolate; radial cell very narrow; posterior basitarsus long and slender, usually longer than the remaining segments of hind tarsi combined; abdomen slender; first tergite distinctly longer than broad at apex, usually weakly longitudinally sculptured, but sometimes almost polished; second tergite with a more or less distinct curved transverse furrow near its middle, usually completely polished like the third and following tergites; ovipositor sheaths about as long as the body or nearly. Head, thorax, and abdomen varying from entirely black to practically entirely testaceous; usually, however, the head is black with more or less of the face and cheeks ferruginous, the thorax mostly black and the abdomen black at base and apex; wings hyaline; legs, including all coxae, pale testaceous, except the hind tibiae which are whitish, with the apex and a narrow incomplete annulus at base black, and the hind tarsi which are black, with the base of the basal segment white.

These notes are based on a considerable number of specimens, as follows: The types of all the species listed in the above synonymy; 28 specimens, all from Illinois, in the collection of the University of Illinois; 2 in the collection of the Boston Society of Natural History, from Ashland Junction, Maine, and Weston, Massachusetts; and 44 specimens in the United States National Museum, including 6 which were reared from *Pithinolophus indentata* Dyar at East River, Connecticut, by C. R. Ely; 1 recorded as a parasite of *Ancylis comptana* Frölich, in Virginia, under Bureau of Entomology No. 3552X; 1 labeled "Parasite on ?*Coelostathma discopunctana*, Washington, District of Columbia, Chittenden No. 6815"; and collected specimens from Virginia, New Jersey, Illinois, Florida, Alabama, New York, Pennsylvania, Ohio, Michigan, Kansas, Iowa, New Hampshire, and Canada.

33. BASSUS CARPOCAPSAE Cushman

Bassus carpocapsae CUSHMAN, Proc. U. S. Nat. Mus., vol. 48, 1915, p. 508. Female.

Bassus carpocapsae CUSHMAN, Proc. Ent. Soc. Wash., vol. 17, 1915, p. 142. Male.

Type.—In the United States National Museum.

Most similar to *laticinctus*, but distinguished especially by the differences noted in the key. Face short and very broad; labial palpi short, the third segment minute; malar space not distinctly half the eye height; temples very narrow, strongly receding; ocell-ocular line about twice the diameter of an ocellus: frontal impressions very small and shallow; antennae usually 32 to 38 segmented, very slender; scape rather slender; first flagellar segment not distinctly as long as the scape and pedicel combined; head scarcely hollowed out behind; parapsidal furrows strong, foveolate; propodeum rather short, convex, strongly declivous behind, entirely coarsely rugose; mesopleural furrow usually distinctly foveolate; areolate of fore wing triangular, petiolate; medius obsolescent basally; first abscissa of mediella fully as long as the second; abdomen stout; first tergite short and broad at apex, longitudinally striate; second and following tergites polished; ovipositor sheaths about two-thirds as long as the body. Head black, with narrow ferruginous superior orbital lines, and sometimes with face and cheeks mostly ferruginous; thorax black; legs testaceous, the posterior coxae often more or less black; posterior tibiae dusky at extreme tips, less broadly so than in *laticinctus*; posterior tarsi more or less dusky; wings slightly dusky; abdomen varying from black, with second and most of third tergites testaceous, to entirely testaceous with only slight duskiness on the first tergite.

In addition to the type series, which contains specimens from Massachusetts, Delaware, Virginia, Maryland, and Pennsylvania, most of which were reared from *Carpocapsa pomonella* Linnaeus, the National Museum has five specimens recorded as a parasite of the same host of Dover, Delaware, under Quaintance No. 9287 (E. R. Selkrigg).

34. BASSUS LATICINCTUS (Cresson)

Microdus laticinctus CRESSON, Canad. Ent., vol. 5, 1873, p. 53.

Microdus ocellanae RICHARDSON, Canad. Ent., vol. 45, 1913, p. 211.

Microdus earinoides DU PORTE (not Cresson), Rep. Quebec Soc. Protection Plants, vol. 7, 1915, p. 76.

Type.—The type of *laticinctus* is in the Philadelphia Academy of Science; that of *ocellanae* is in the Canadian National collection at Ottawa.

Closely related to *carpocapsae*, but undoubtedly distinct and separable by the differences noted in the key and in the above characterization of *carpocapsae*. It also somewhat resembles *annulipes*, and has sometimes been identified as *earinoides* Cresson, which is a syn-

onym of *annulipes*, but it is readily separated from that species by the narrower, strongly receding temples, the usually more or less blackish hind coxae, the noncarinate scutellum, and the usually partly striate second tergite.

Face broader than long to the apex of clypeus but not so short as in *annulipes*, shining, finely punctate; temples strongly receding, without a bulge or tubercle; antennae slender, usually 33 to 38 segmented; third segment of labial palpi minute, sometimes indistinct; head, viewed from above, scarcely hollowed out behind; parapsidal furrows impressed, foveolate; middle lobe of mesoscutum not prominently elevated; propodeum rugose, not areolated, strongly declivous posteriorly; mesopleural furrow finely foveolate; metapleura shining, evenly punctate; inner spur of posteric tibia or about half as long as the basitarsus; areolet of fore wing triangular, petiolate, usually not so oblique as in *annulipes;* medius very weak basally; first abscissa of mediella about as long as the second; abdomen much more slender than in *carpocapsae;* first tergite longer than broad at apex, longitudinally striate, the striae usually straight and rather strong; second tergite about as long as broad, and usually delicately longitudinally striate on the basal two-thirds, rest of abdomen polished; ovipositor sheaths at least two-thirds as long as the body. Head and thorax entirely black; antennae black; palpi yellow; wings very weakly dusky, sometimes practically hyaline; anterior and middle legs entirely testaceous; hind legs testaceous, with their coxae usually more or less blackish basally, and their tibiae usually rather broadly blackish apically; the hind tarsi are usually mostly yellowish; first abdominal tergite entirely black; the second nearly always more or less yellowish; the third and following black.

The above notes are based on the type of *laticinctus* and on the following material in the National Museum: Five specimens reared from *Tmetocera ocellana* Schiffermüller at St. Annes, Quebec; one reared from the same host, in Clarke County, Washington, by E. J. Newcomer, under Quaintance No. 11440; another recorded as a parasite of the same host at Wallingford, Connecticut, by B. A. Porter, under Quaintance No. 16628; one from Vineland, New Jersey, also reared from the bud moth; and five specimens without locality data.

35. BASSUS IMMACULATUS Gahan

Bassus immaculatus GAHAN, Proc. U. S. Nat. Mus., vol. 55, 1919, p. 118.

Type.—In the United States National Museum.

Distinguished from all related species by the uniform, delicately granular, sculpturing of the propodeum. The four specimens of the type series have the head, thorax, and abdomen uniformly testaceous; but additional material may show some variation in this respect; the legs are entirely testaceous with only the apex of hind

tibiae, a narrow annulus near their base, and the tarsi more or less blackish; and the wings are very faintly dusky. Head scarcely hollowed out behind; face broader than long; third segment of labial palpi very short, hardly apparent; parapsidal furrows sharply impressed, not distinctly foveolate; middle mesonotal lobe prominent; first abdominal tergite delicately granular like the propodeum, without carinae; remainder of abdomen polished, the second tergite sometimes with very faint suggestion of fine reticulation; ovipositor sheaths a little shorter than the body.

Host.—*?Phthorimaea striatella* Murtfeldt.

Known only from the four specimens comprising the type series. These are from Baton Rouge, Louisiana.

36. BASSUS RUBRIPES (Cresson)

Agathis rubripes Cresson, Trans. Amer. Ent. Soc., vol. 4, 1872, p. 183.

Type.—In the Philadelphia Academy of Science.

This species differs from all related forms in combining a subrostriform face with closely granular basal abdominal tergites, hind coxae, and pro and meso pleura. Face as long as broad; clypeus long, strongly convex; labial palpi slender, the third segment not shortened, nearly as long as the second; malar space two-thirds to three-fourths as long as the eyes; head strongly excavated behind; the temples above bulging strongly posteriorly; antennae usually 26 to 29 segmented; parapsidal furrows impressed, minutely foveolate or punctate; scutellum flat, polished, longer than broad at base; propodeum rather long, only very slightly declivous posteriorly, mostly closely granular, rugulose laterally, and with two median longitudinal carinae that are very close and diverge only slightly posteriorly; propleura, the mesopleura posteriorly, and the metapleura completely, granular and opaque, the granulation being coarsest on the metapleura and very fine on the mesopleura; posterior coxae closely granular and opaque; areolet of fore wing triangular, sessile; first abscissa of mediella longer than the second; nervellus somewhat angled and emitting a distinct discoidella; first abdominal tergite short and broad, conspicuously impressed basally, and with two more or less distinct longitudinal keels bordering the basal impression; the surface of this tergite finely granular and opaque; second tergite much broader than long, evenly granular, but usually more finely so than the first; third and following tergites polished; ovipositor sheaths as long as the abdomen and propodeum combined. Head and thorax entirely black; all coxae black; basal segment of all trochanters more or less blackish; remainder of legs testaceous, except the tarsi which are more or less dusky or blackish; wings somewhat infumated; abdomen black with the second segment, and sometime the sides of the apical segments, more or less rufous.

The following material served as the basis for the above discussion: The type which is from Texas; 24 specimens in the National Museum from Florida, Louisiana, Georgia, Wyoming, Ohio, Pennsylvania, Virginia, Maryland, District of Columbia, New York, Massachusetts, and Canada; 1 specimen from Illinois in the collection of the University of Illinois; and 3 specimens from Edgartown, Massachusetts, in the collection of the Boston Society of Natural History.

37. BASSUS NIGRICOXUS (Provancher)

Microdus nigricoxus PROVANCHER, Addit. faun. Canad. Hymen., 1886, pp. 137 and 138.

Type.—In the Museum of Public Instruction at Quebec Canada.

A small species with an entirely black body and black hind femora. Face short, impunctate, polished; labial palpi short, the third segment very small; antennae usually 32 to 36 segmented, slender; parapsidal furrows sharply impressed, usually finely foveolate; middle mesonotal lobe rather strongly convex; furrow in front of scutellum pitted; scutellum small, convex; propodeum coarsely irregularly rugose; mesopleural furrow finely foveolate; metapleura closely granular and opaque; posterior coxae large, a little longer than the first abdominal segment; areolet of fore wing very small, triangular, petiolate; medius very faint, almost obsolete; first abscissa of mediella slightly shorter than the second; abdomen slender; first tergite much longer than broad at apex, entirely closely granular and opaque; second tergite a little broader than long and closely granular and opaque like the first; third tergite granular basally, polished apically like the remaining segments; ovipositor sheaths about as long as the abdomen or very slightly longer. Head, thorax, and abdomen black; tegulae black; all coxae, basal segment of trochanters, and the posterior femora black; anterior and middle legs brownish yellow beyond the trochanters; posterior tibiae blackish, with the extreme base and a more or less distinct annulus on the middle brown; wings subhyaline.

I have seen only seven specimens of this species, all of which are in the United States National Museum; one of these is labeled "Cana. 2068, Collection C. F. Baker"; one is from Nerepis, New Brunswick (A. G. Leavitt); one from Jamesburg, New Jersey; one from Pennsylvania; and three from Oswego, New York.

38. BASSUS COLEOPHORAE Rohwer

Bassus coleophorae ROHWER, Proc. U. S. Nat. Mus., vol. 49, 1915, p. 230.
Bassus pyrifolii VIERECK, Bull. 22, Conn. Geol. and Nat. Hist. Survey, 1917 (1916) pp. 226 and 229.

Type.—The type of *coleophorae* is in the United States National Museum; that of *pyrifolii* is in the collection of the agricultural experiment station at New Haven, Connecticut.

Closely resembles *nigricoxus*, but can be distinguished by the smoother abdomen, hind coxae, and metapleura, by the pale tegulae and trochanters and by the second tergite being sometimes more or less reddish. It apparently is even more similar to *cinctus*, the only conspicuous difference being the darker hind femora of *coleophorae;* it is possible that this species is merely an unusually dark form of *cinctus*. The type of *pyrifolii* is almost an exact duplicate of that of *coleophorae*.

Face short, impunctate, shining; malar space less than half the length of the eyes; antennae of the types of both *pyrifolii* and *coleophorae* 31-segmented; ocellocular line less than twice the diameter of an ocellus; parapsidal furrows impressed, finely foveolate; mesonotal lobes weakly punctate; scutellum polished; propodeum rugulose; mesopleural furrow weakly foveolate; posterior coxae smooth, faintly granular above; metapleura very weakly sculptured, shining; areolet of anterior wing small, triangular, petiolate; abdomen slender; first tergite longer than broad at apex, very finely granular; second and following tergites smooth and shining; ovipositor sheaths a little longer than the abdomen. Head and thorax black; tegulae yellow; all coxae black; fore and middle legs below the coxae yellowish; hind trochanters pale; hind femora black; posterior tibiae white, with an annulus near base and the apical third or more black; middle and hind tarsi more or less blackish; wings hyaline; abdomen black, with the second tergite sometimes slightly reddish.

Known only from the type and paratype of *coleophorae* and the type of *pyrifolii;* the former were recorded as reared from *Coleophora leucochrysella* Clemens at Charter Oak, Pennsylvania; the latter is from New Haven, Connecticut.

39. BASSUS CALIFORNICUS, new species

Most similar to *cinctus*, but differs in having all the coxae entirely black, the trochanters more or less blackish, the temples distinctly broader and less receding, the malar space longer, and the ovipositor sheaths usually longer.

Female.—Length, 5.4 mm. Face slightly broader than long to the apex of clypeus, completely polished; malar space more than half as long as the eyes; clypeus more than twice as broad as long, somewhat convex; labrum transverse, broadly truncate at apex; third segment of labial palpi very small but distinct; temples rounded, not strongly receding; frons immargined; postocellar line twice, ocellocular line more than twice the diameter of an ocellus; antennae slender, 33-segmented in the type, the six or eight apical segments very short, hardly longer than broad; a rather sharp ridge between antennae; parapsidal furrows sharply impressed and foveolate; mesonotal lobes smooth and shining; furrow in front of scutellum pitted;

scutellum convex, polished; propodeum strongly rounded anteriorly, rugose, not areolated; propleura rugulose anteriorly, mesopleural furrow sharply impressed, foveolate; metapleura mostly smooth; posterior coxae smooth and shining; inner spur of hind tibia less than half the basitarsus; areolet of anterior wing very small, triangular, strongly petiolate; first abscissa of mediella a little shorter than the second; first abdominal tergite a little longer than broad, very minutely, weakly coriaceous except apically, where it is polished, entirely strongly shining; remainder of abdomen polished; ovipositor sheaths about three-fourths as long as the body. Head and thorax entirely black; all coxae and more or less of the trochanters black; all femora ferruginous, the posterior pair a little blackish at tips; anterior and middle tibiae concolorous with their femora, the middle pair, however, with a blackish annulus near base and the apex more or less dusky; hind tibiae yellowish, paler than their femora, with an incomplete black annulus near base and the apical fourth black; all tarsi more or less blackish; wings very slightly dusky; abdomen black, with the second tergite and sometimes the basal half of the third more or less reddish.

Male.—Essentially as in the female.

Type.—Cat. No. 28692, U.S.N.M.

Type locality.—Los Angeles, California.

Described from two females and one male, all from the above locality without further data.

40. BASSUS CINCTUS (Cresson)

Microdus cinctus CRESSON Canad. Entom., vol. 5, 1873, p. 53.
Microdus pimploides VIERECK, Trans. Kans. Acad. Sci., vol. 19, 1905, p. 276.
Bassus winkleyi VIERECK, Bull. 22, Conn. Geol. and Nat. Hist. Survey, 1917 (1916), pp. 227 and 229.

Type.—The type of *cinctus* is in the Philadelphia Academy of Sciences; that of *pimploides* is at the University of Kansas; and that of *winkleyi* is in the collection of the agriculture experiment station at New Haven, Connecticut.

After studying these three types I am of the opinion that they belong to the same species; *pimploides* and *winkleyi* therefore are suppressed as synonyms of *cinctus*, which has priority. A small rather slender species, varying in length from 3 to 4.5 mm.; face distinctly broader than long, polished, malar space less, usually much less, than half the length of the eyes; third segment of labial palpi very small, sometimes indistinct; temples sloping gradually from the eyes, but not especially narrow; antennae slender, 30 to 37 segmented in the material examined; ocell-ocular line not distinctly quite twice the greatest diameter of an ocellus; parapsidal furrows sharply impressed, usually minutely foveolate; furrow in front of

scutellum foveolate; scutellum rather small, polished; propodeum evenly rounded antero-posteriorly, rugoso-reticulate, not areolated; propleura mostly polished, a little roughened anteriorly; mesopleura more or less punctate or granular; posterior coxae minutely granular, shining; inner spur of hind tibia very nearly half as long as the basitarsus; areolet of fore wing small, triangular, usually petiolate; medius very weak, sometimes almost wanting; abdomen slender; first tergite longer than broad at apex; very finely uniformly granular and opaque or subopaque; second tergite sometimes polished but often delicately coriaceous; remainder of dorsum of abdomen highly polished; ovipositor sheaths a little longer than the abdomen. Head and thorax entirely black; anterior and middle legs, including coxae, entirely yellowish ferruginous; posterior coxae varying from entirely ferruginous to mostly black; hind trochanters and femora ferruginous, the latter blackish apically; hind tibiae yellowish white, with an incomplete black annulus near base and the apical third black; their tarsi black; wings hyaline; first abdominal tergite always completely black, the second usually yellowish on at least the basal half; third and following segments entirely black.

The above characterization was drawn from the following material: The types of *cinctus*, *pimploides*, and *winkleyi*, 18 specimens in the United States National Museum from the various localities in Indiana, Illinois, Michigan, Minnesota, Virginia, Florida, Pennsylvania, New Jersey, Massachusetts, New York, and Canada; 1 specimen from Bar Harbor, Maine (C. W. Johnson), in the collection of the Boston Society of Natural History; and 1 from Illinois in the University of Illinois. One of the National Museum specimens is recorded as a parasite of *Eulia velutinana* Walker at Winchester, Virginia.

41. BASSUS AGILIS (Cresson)

Microdus agilis Cresson, Canad., Ent., vol. 5, 1873, p. 52.
Agathis quaesitor Provancher, Natural. Canad., vol. 12, 1880, p. 176.

Type.—The type of *agilis* is in the Philadelphia Academy of Sciences; that of *quaesitor* is in the Museum of Public Instruction at Quebec.

The original description of *queasitor* and notes on Provancher's type by S. A. Rohwer describe *agilis* so exactly that I have no hesitation in considering the two names synonymous, although I have not seen the type of *quaesitor*. This species is relatively very constant in color and sculpture, and is usually very easily distinguished. Face about as long as broad, but not rostriform; malar space inclining strongly inwardly, and at least half as long as the eyes; clypeus somewhat convex, more than twice as broad as long, and broadly emarginate at apex; third segment of labial palpi short but distinct, somewhat less than half as long as the second segment; a sharp

prominence between antennae extending nearly to the median ocellus; antennae long and slender, usually 36 to 41 segmented; temples gradually receding; head only slightly hollowed out behind, as seen from above; mesoscutum elongate; parapsidal furrows sharply impressed and meeting only a short distance before the posterior margin of scutum, more or less foveolate; furrow in front of scutellum distinctly pitted; scutellum convex, polished; propodeum completely strongly rugose, without carinae, its dorsal face long, not distinctly rounded antero-posteriorly; propleura smooth except anteriorly where it is finely rugulose; mesopleura furrow impressed, foveolate; metapleura finely granular, rugose below; posterior coxae very delicately granular and subopaque; second cubital cell triangular, very small, narrow, subsessile, or with a short petiole; medius very weakly developed; first abscissa of mediella very slightly shorter than the second; first abdominal tergite longer than broad at apex, finely evenly granular, sometimes also a little wrinkled basally; second tergite broader than long, finely evenly granular; the third sometimes weakly granular toward base; remainder polished; ovipositor sheaths about as long as the thorax and abdomen combined. Head black, with the labrum and more or less of clypeus red; antennae usually black; thorax entirely black, very rarely with a small reddish spot on metapleura; legs, including all coxae entirely, bright reddish yellow, with the extreme apex of hind femora and the middle and posterior tarsi blackish; hind tibiae yellowish, with an annulus near base, and the apex broadly, black; wings hyaline or subhyaline; first, second, and often more or less of third tergites reddish testaceous, the first tergite rarely a little infuscated basally; most of third and following tergites usually entirely black, but very rarely mostly reddish. Length, usually 4 to 6.5 mm.

This is a very common species and a large amount of material has been studied in the course of the preparation of the above notes. This includes the type of *agilis*, which is from Massachusetts; many specimens in the National Museum, including several series reared in the Bureau of Entomology, from *Pyrausta nubilalis* Huebner, the European Corn Borer, collected at Lynn, Saugus, Melrose, Wakefield, and Watertown, Massachusetts, under Webster No. 16490; four specimens reared from *Archips rileyana* Grote, at Victoria, Missouri, under Bureau of Entomology No. 234; two from *Aristotelia absconditella* Walker, Nashville, Tennessee, and Fordsville, Kentucky; two from *Epiblema minutana* Kearfott, Whitesbog, Virginia, under Quaintance No. 12769; and collected specimens from Pennsylvania, District of Columbia, and New Jersey; and a large number of reared specimens at the Gipsy Moth Laboratory, Melrose Highlands, Massachusetts, comprising series from *Archips fervidana* Clemens and *A. cerasivorana*

Fitch, which were taken at various Massachusetts and New Hampshire localities. I have also seen two specimens from Illinois in the collection of the University of Illinois.

42. BASSUS DISCOLOR (Cresson)

Microdus discolor Cresson, Canad. Ent., vol. 5, 1873, p. 52.
Bassus brittoni Viereck, Bull. 22, Conn. Geol. and Nat. Hist. Survey, 1917 (1916), pp. 227 and 229.

Type.—The type of *discolor* is in the Philadelphia Academy of Sciences; that of *brittoni* is in the agricultural experiment station at New Haven, Connecticut.

Very similar to *agilis*, but much more variable in color, the thorax varying from completely black to completely testaceous, and the head and abdomen also varying considerably; the head is usually mostly pale; and the pleura and abdomen are nearly always more closely granular and more opaque than in *agilis*; the ovipositor sheaths are a little shorter and the wings usually more uniformly and more distinctly tinted with brownish. In size *discolor* averages considerably smaller than *agilis*.

Face at least as broad as long; malar space about half the eye height; third segment of labial palpi minute; elevation between the antennae very low, not so pronounced as in *agilis;* antennae usually 34 to 38 segmented slender, even the apical segments elongate; thorax rather narrow; parapsidal furrows impressed, usually finely foveolate; furrow in front of scutellum pitted; propodeum closely rugose, without carinae; propleura entirely finely granular, with a few rugae anteriorly; mesopleura usually minutely granular or coriaceous below and with a finely foveolate longitudinal furrow; metapleura closely granular and opaque; hind coxae also granular and opaque; second cubital cell very small, triangular, petiolate; abdomen more slender than is usually true in *agilis;* the first tergite much longer than broad, closely strongly granular and opaque; the second entirely and usully the third except at apex also granular and opaque; ovipositor sheaths about as long as the propodeum and abdomen combined. Head mostly testaceous, with the frons vertex, and occiput usually more or less black; thorax black to testaceous, all degrees of variation occurring; legs testaceous; the hind femora rather broadly black at apex above; the hind tibiae not paler than their femora and with a more or less distinct blackish annulus near base, and the apex broadly blackish; hind tarsi blackish; wings a little tinted with brown; abdomen testaceous, more or less marked with blackish; the first tergite is sometimes partly blackish, and the third and following are usually more or less black above, but nearly always pale laterally. Length, usually 3 to 4 mm.

This characterization is drawn from the following material: The types of *discolor* and *brittoni*—six specimens in National Museum from

Illinois; Iowa; Anglesea, New Jersey; Nashville, Tennessee; and Canada; and two specimens in the collection of the University of Illinois—one from New Orleans, Louisiana, and one from Algonquin, Illinois.

SPECIES OF BASSUS NOT INCLUDED IN THE KEY

BASSUS RUGAREOLATUS Viereck

Bassus rugareolatus VIERECK, Bull. 22, Conn. Geol. and Nat. Hist. Survey, 1917 (1916), pp. 228 and 229.

Type.—In the agricultural experiment station at New Haven, Connecticut. It is in poor condition, the abdomen being missing and the antennae broken. The label indicates that the specimen is a male.

Because of the condition of the type and the unsatisfactory original description, I have considered it unwise to place this species in the key. It appears to be most similar to *erythrogaster;* but the malar space is longer than in that species and the face about as long as broad; also the hind trochanters are black and the propodeum is more strongly rugose. The ocell-ocular line is less than twice the diameter of an ocellus; the vertex rather flat; third segment of labial palpi longer than broad; parapsidal furrows shallow, smooth, most sharply impressed anteriorly; mesopleural furrow polished: hind femora and tibiae rather short and stout. Head and thorax black, the metapleura slightly reddish; anterior and middle legs mostly black; hind coxae and femora red, their trochanters, tibiae, and tarsi black; wings infuscated.

These brief notes are based on the type which is from New Haven, Connecticut.

BASSUS QUEBECENSIS (Provancher)

Microdus quebecensis PROVANCHER, Natural Canad., vol. 12, 1880, p. 178.

Type.—In the Museum of Public Instruction at Quebec, Canada.

On the basis of the original description and notes made on the type by S. A. Rohwer, this species appears to be *laticinctus* Cresson, and I have little doubt that is that species. However, because of certain slight differences indicated by Mr. Rohwer, such as the presence of converging furrows from the lateral ocelli to the base of the antennae, an unusually long scape which is "as long as the second and third antennal segments," and the presence of a "poorly defined petiolate areola" on the propodeum, I have thought it better not to synonymize the species with *laticinctus* at present.

?BASSUS VERTICALIS (Cresson)

Microdus verticalis CRESSON, Trans. Amer. Ent. Soc., vol. 4, 1872, p. 182.

I have been unable to locate the type of this species, and since the original description is not sufficiently distinctive, *verticalis* has not

been included in the key to species. Cresson stated that "this may be the female of *nigriceps*." But the type of his *Microdus nigriceps* is a female and belongs to *Crassomicrodus*. The longer ovipositor ascribed to *verticalis*, combined with other characters mentioned in the description, indicates that the species belongs in the genus *Bassus*.

HOST LIST

Host	Parasite
Acrobasis betulella Hulst	*Bassus calcaratus* (Cresson).
Acrobasis caryivorella Ragonot	*calcaratus* (Cresson).
	acrobasidis Cushman.
Acrobasis, species	*acrobasidis* Cushman.
Ancylis comptana Froelich	*annulipes* (Cresson).
Archips cerasivorana Fitch	*agilis* (Cresson).
Archips fervidana Clemens	*agilis* (Cresson).
Archips rileyana Grote	*agilis* (Cresson).
Aristotelia absconditella Walker	*agilis* (Cresson).
Carpocapsa ninana Riley	*ninanae* Muesebeck.
Carpocapsa pomonella Linnaeus	*carpocapsae* Cushman
Coelostathma discopunctanum Clemens	*annulipes* (Cresson).
Coeleophora leucochrysella Clemens	*coleophorae* Rohwer.
Epiblema minutana Kearfott	*agilis* (Cresson).
Eucosma desertana Zeller	*bicolor* (Provancher).
Eulia velutinana Walker	*cinctus* (Cresson).
Isophrictis, species	*buttricki* Viereck.
Lixus scrobicollis Boheman	*simillimus* (Cresson).
Mineola vacinii Riley	*immaculatus* Gahan.
Mompha stellella Busck	*gibbosus* Say.
Papaipema nitela Guenee	*gibbosus* Say.
Phthorimaea glochinella Zeller	*gibbosus* Say.
Phthorimaea operculella Zeller	*gibbosus* Say.
?Phthorimaea striatella Murtfeldt	*immaculatus* Gahan.
Pithinolophus indentata Dyar	*annulipes* (Cresson).
Psilocorsis, species	*calcaratus* (Cresson).
Pyrausta nubilalis Huebner	*agilis* (Cresson).
Pyrausta pertextalis Lederer	*sanctus* Say.
Tmetocera ocellana Schiffermueller	*laticinctus* (Cresson).

EXPLANATION OF PLATES

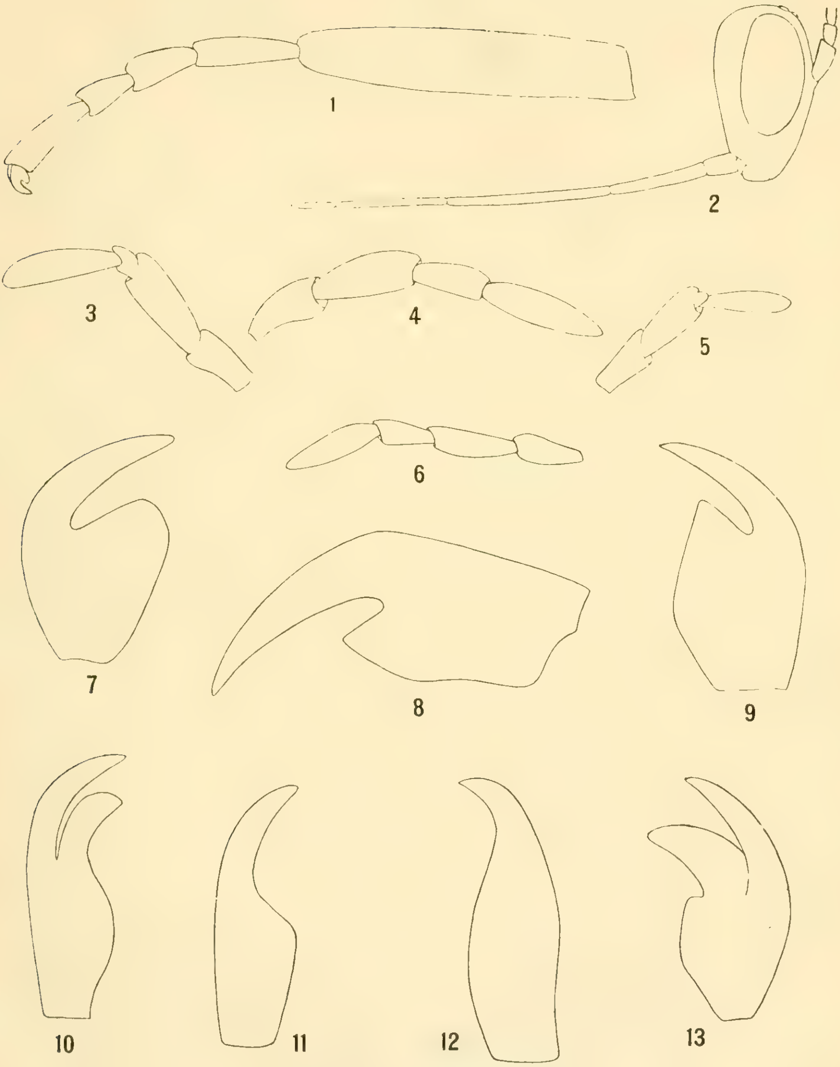
The drawings on Plate 1 are by the author. The photographs on Plate 2 were taken by Mr. C. E. Hood, of the Bureau of Entomology.

PLATE 1

FIG. 1. *Agathirsia thoracica.* Posterior tarsus.
2. *Aenigmostomus longipalpus.* Lateral view of head showing the long beak formed by the modified maxillary palpi.
3. *Bassus sanctus.* Labial palpus.
4. *Bassus spiracularis.* Labial palpus.
5. *Bassus calcaratus.* Labial palpus.
6. *Bassus nigripes.* Labial palpus.
7. *Bassus texanus.* Claw of anterior tarsus.
8. *Agathirsia thoracica.* Claw of anterior tarsus.
9. *Earinus limitaris.* Claw of anterior tarsus.
10. *Zelomorpha arizonensis.* Claw of anterior tarsus.
11. *Aenigmostomus longipalpus.* Claw of anterior tarsus.
12. *Crassomicrodus divisus.* Claw of anterior tarsus.
13. *Bracon montrealensis.* Claw of anterior tarsus.

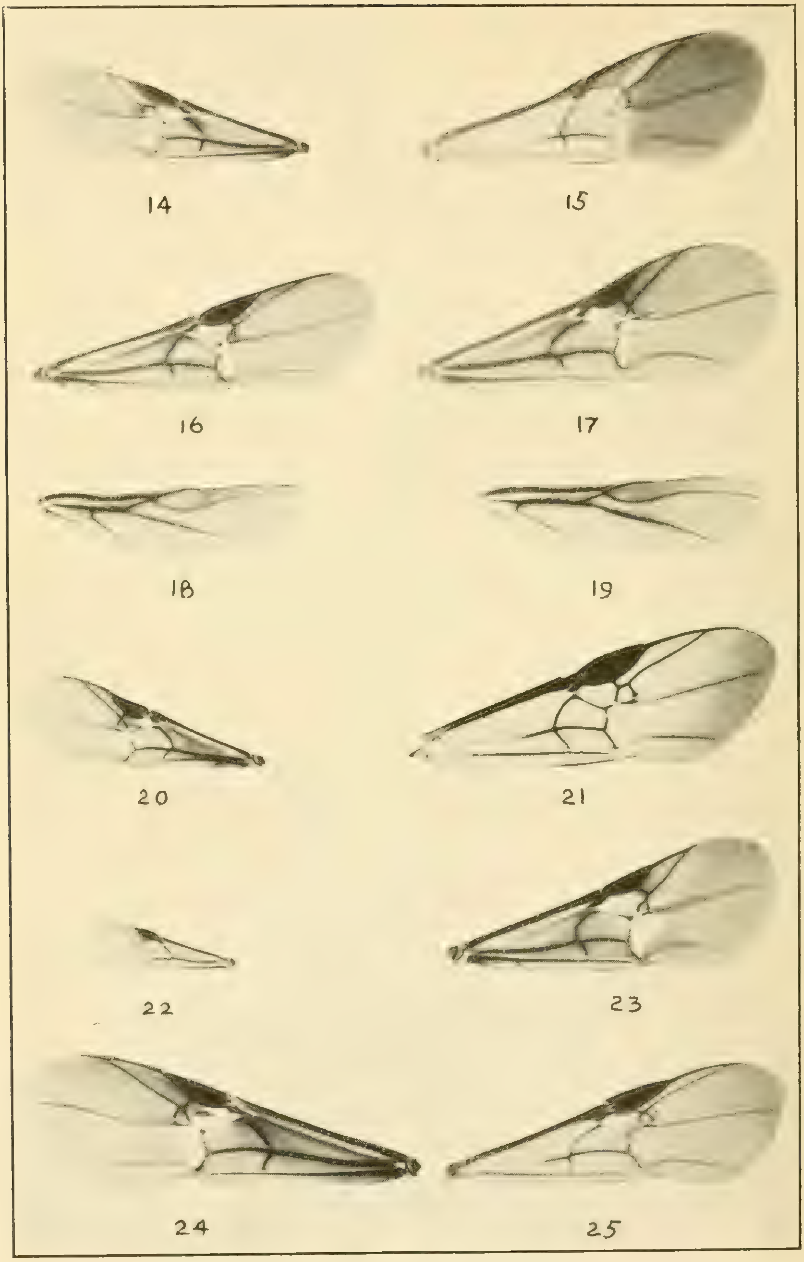
PLATE 2

FIG. 14. *Bracon vulgaris.* Anterior wing.
15. *Agathirsia testacea.* Anterior wing.
16. *Bassus simillimus.* Anterior wing.
17. *Bassus spiracularis.* Anterior wing.
18. *Bassus simillimus.* Posterior wing.
19. *Bassus spiracularis.* Posterior wing.
20. *Bassus calcaratus.* Anterior wing.
21. *Earinus limitaris.* Anterior wing.
22. *Aenigmostomus longipalpus.* Anterior wing.
23. *Crassomicrodus divisus.* Anterior wing.
24. *Bassus sanctus.* Anterior wing.
25. *Zelomorpha arizonensis.* Anterior wing.



DETAILS OF BRACONID FLIES

FOR EXPLANATION OF PLATE SEE PAGE 71



WINGS OF BRACONID FLIES

FOR EXPLANATION OF PLATE SEE PAGE 71

INDEX

[Accepted generic names are in boldface type; accepted specific names in roman; synonyms in italics]

IDENTITY OF HALLOWELL'S SNAKE GENERA MEGALOPS AND AEPIDEA

By Leonhard Stejneger,
Head Curator of Biology, United States National Museum

It has long been realized that Hallowell's paper "Report upon the Reptilia of the North Pacific Exploring Expedition, under command of Capt. John Rogers, U. S. N.", edited after the author's death by E. D. Cope, and published in the Proceedings of the Academy of Sciences, Philadelphia, 1860, (pp. 480–510) contained many errors both as to identifications, descriptions, and localities. Many of these have been cleared up from time to time, but some of them have remained a mystery to the present time. One of the difficulties has been that the specimens were not originally properly recorded and labeled. The collections made by the expedition were taken to Philadelphia to be worked up, as there was nobody then in Washington who knew anything about exotic reptiles and amphibians, Hallowell being the only man in the United States who up to then had any experience in that line, except Girard whose connection with the Smithsonian Institution ceased about that time. Later the specimens were returned to the United States National Museum and added to a vast accumulation of uncatalogued herpetological material. In 1869 Prof. S. F. Baird, overwhelmed though he was by other work, began to catalogue part of these collections, giving them numbers in the record book and on the paper labels, but without taking time to identify the species, and often not even indicating whether the specimen was a snake, lizard, or frog, in most cases only noting the locality and name of collector in very general terms, trusting to the original labels when filling in the details later. By 1881 many of the old paper labels had deteriorated to such an extent as to be illegible and the decision was made to attach a tin tag with the stamped catalogue number to each specimen. Unfortunately, by this time Professor Baird had given up direct connection with the reptile collection, and the clerk to whom this work

to a great extent was delegated did not know anything about reptiles, their names, the literature involved, or the geography of the countries inhabited by them. He was also very often mistaken in his deciphering the old numbers, either carelessly written originally or blurred with age, so that this retagging of the collection resulted in an orgy of errors, some of which I have been able to discover, though the majority will probably remain incorrigible. At the conclusion of this retagging there remained hundreds of specimens, with or without data, which were recatalogued under new numbers, the old numbers being "obliterated."

Quite a few specimens of the collections brought home by the Rogers North Pacific Exploration Expedition suffered a similar fate. In my "Herpetology of Japan" (Bull. U. S. Nat. Mus., No. 58, 1907) I had occasion to call attention to some of them (for instance on pages 23, 96, 124, 148, 157, 175, 191, 196, 205, 239, 260, 328, 334, 340, 367, 412, 475), and others have been discovered since (thus the cotypes of *Lygosaurus pellopleurus* Hallowell,[1] missing in 1907, have been found and reentered as Nos. 42110 and 42114).

One of the most perplexing mysteries of this kind has been the *Megalops maculatus* Hallowell,[2] alleged to have been collected in Tahiti by Mr. Adams. The description of the somewhat defective specimen was too insufficient to identify it with any known species, and as no land snake has been found in Tahiti by any other collector, the status of this species and the genus founded upon it has remained unsolved. Matters were made still worse when Cope, in 1895, in dissecting the specimen from Hongkong, Cat. No. 7339, U.S.N.M., which Hallowell had doubtfully referred to *Homalopsis buccatus*, erroneously assumed that he had before him Hallowell's *Megalops maculatus.* Cope redefined it as a separate genus and gave it the name *Anoplophallus maculatus*, because *Megalops* was preoccupied. As I have shown elsewhere,[3] the specimen thus erroneously identified by two eminent herpetologists is that of a very common East Indian snake, *Lycodon subcinctus.* The true type not having turned up yet, I had to conclude, less than a year ago: "What Hallowell's *Megalops maculatus* from Tahiti really represents is still a mystery."[3]

In glancing over a shelf of old unidentified material a few days ago, my eye caught the word "Tahiti" on the faded paper label of a snake. It was at once confronted with Hallowell's original description of *Megalops maculatus*, with which it was found to agree in every detail. Here, then, was the type, Cat. No. 7367,

[1] Proceedings Academy of Natural Sciences, Philadelphia, 1860, p. 496.
[2] Idem, p. 488.
[3] Proc. U. S. Nat. Mus., vol. 66, art. 25, 1925, pp. 90–91.

U.S.N.M. In the record book the original entry under that number has only the following:

Number: 7367.

Locality: Tahiti.

Collected by: Mr. Adams.

Number of specimens: 1.

An examination of the specimen, mutilated exactly as described by Hallowell, shows it to be a *Leptodeira* of the *annulata* group, the scale formula agreeing with the form described as *L. albofusca* in Boulenger's Catalogue of Snakes in the British Museum (vol. 3, 1896, p. 95), of which *Megalops maculatus* Hallowell consequently is a synonym. The range of the species extends from Mexico in the north to Paraguay in the south. The only place where the Rogers expedition could have obtained it is Nicaragua, where extensive collections were made.

On the same page (p. 488) as *Megalops maculatus* Hallowell described a new genus and species of snakes as *Aepidea robusta* with the habitat Gaspar Straits. This name has also remained more or less an enigma, since the type specimen has not been forthcoming until it was recognized in connection with the above investigation and shown to be a specimen (No. 7324) which has been on the shelves for many years under the name of *Gonyosoma oxycephalum* with the more than dubious locality "Japan" and collector "Perry Exped.," derived from the original record under that number. A careful comparison of this specimen with Hallowell's elaborate description of *Aepidea robusta*, with which it agrees in the minutest details, shows that Boulenger's conclusion as to its identity was correct and that the specimen is in reality Hallowell's type. An examination of the original record book shows, furthermore, that the correct number of this specimen should be Cat. No. 7508, U.S.N.M., with the "locality" Gaspar Straits and "collected by" Capt. Rodgers (sic!). The transposition of the numbers was undoubtedly made at the time of the tin-tagging described above, and the correct number has now been restored to the specimen. The "Gaspar Straits" is the strait between Banka and Billiton Islands in the Malay Archipelago, throughout which the species is common. The species has been reported since from Banka but not as yet from Billiton.

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NOTES ON THE AGE OF THE CONTINENTAL TRIASSIC BEDS IN NORTH AMERICA, WITH REMARKS ON SOME FOSSIL VERTEBRATES

By F. R. von Huene

Of the University of Tübingen, Germany

For paleontological purposes, it is sometimes unfortunate that the continental Triassic formations of North America can not in all of their parts be properly incorporated in the standard stratigraphic scheme. The standard scheme is, of course, based on marine fossils, and in North America, as in Europe, transition beds between continental and marine strata are missing. This is the cause of the difficulty. In the present paper the author has endeavored to present a generalized classification of the vertebrate-bearing Triassic beds of North America.

The Triassic deposits near the Atlantic coast and the Red Beds in the central and western regions have a different aspect. Therefore it will be best to treat them separately.

I. *Central and western regions.*—The Triassic Red Beds of these regions are the continuation of and close of a large series beginning at some places with the older Carboniferous, at others with the Permian. Though there is much local variation, the structure and color of the rocks is remarkably uniform. Fossil horizons are rare and it is therefore not easy to compare particular beds that are far distant from one another. The thickness of the Triassic is in general several hundred meters; the lower limit is not accurately fixed and the upper is sometimes badly defined. Whole divisions may be missing, and often it is not possible to detect such a hiatus by a clearly observed discordance.

Ward[1] divides his Shinarump beds in northern Arizona (Powell's original Shinarump group less the Moenkopi formation) 530 meters in thickness, into a lower group, the Shinarump conglomerate, consisting of 240 meters of coarse, cross-bedded sandstone and variegated marls; and an upper group, the Le Roux beds, 240 meters thick and consisting of a lower member of 120 meters of variegated

[1] Ward, L. F., Geology of the Little Colorado Valley, Amer. Journ. Sci., ser. 4, vol. 12, 1901, pp. 407–413.

marls and argillaceous and limy shales containing fossil parasuchians and labyrinthodonts; above it, 30 meters of sandstone, 7 meters of well bedded limestones, 25 meters of so-called "Motar Beds," limy shales with flint, and, finally, 60 meters of calcareous marls. This series of beds has been restudied by Gregory [2] and is now divided into the Chinle formation (upper 450 meters) and Shinarump conglomerate (basal 30 meters). The "Fossil Zone" of Ward is 120 to 240 meters below the top of the Chinle, about the third quarter of the formation. Fragments of bones are recorded also in the Shinarump conglomerate and in the lower part of the Chinle formation as defined by Gregory. The detailed petrologic characters are varied but the larger features are the same for long distances.

In southwestern Colorado above the Permian Cutler formation the unconformable Triassic Dolores formation may be distinguished.[3] The relations of the Dolores formation to the Chinle, the Shinarump, and the Moenkopi formations are still somewhat uncertain, though it probably includes the Chinle and the Shinarump. The lower part of the Dolores contains abundant fragmentary remains of vertebrates.

Vertebrates occur low in the Chinle formation, as Mehl [4] demonstrates in published sections from the region of the Petrified Forest, Arizona, and as noted above in the work of Gregory. Hills [5] found very well preserved fish remains (*Catopterus* cf. *gracilis*) associated with parasuchian teeth in southwestern Colorade 15 meters below the "Shinarump conglomerate" (in lower Dolores). Ward [6] found them also, as noted above, in a second and higher horizon near Tanners Crossing in the Little Colorado Valley, Ariz.

The author's experience in New Mexico [7] (west and southwest of Abiquiu) is that Parasuchians and Labyrinthodonts occur only in and below a conglomerate like Cross's Shinarump, the "Poleo sandstone," now accepted as the equivalent of the Shinarump. From what I have seen in the southern Chama River region in New Mexico. the larger part of the Triassic deposits lie above the Poleo sandstone. In these upper beds the fauna is quite different—*Typothorax*, *Episcoposaurus*, and two other Parasuchian genera, *Belodon scolopax* and *Coelophysis*. It is evident, then, that the lower fauna—*Machaeroprosopus*, *Heterodontosuchus*, *Palaeorhinus*, *An-*

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[2] U. S. Geological Survey, Professional Paper 93, pp. 30–50, 1917.

[3] Cross, Whitman, Bull. Geol. Soc. America, vol. 16, 1905, p. 468.

[4] Mehl, M. G., Quart. Bull. Univ. Oklahoma, March, 1916, pp. 1–44.

[5] Hills, R. C., Note on the occurrence of fossils in the Triassic and Jurassic beds near San Miguel, Colo. Amer. Journ. Sci., ser. 3, vol. 19, 1880, p. 490.

[6] Amer. Journ. Sci., ser. 4, vol. 12, 1901, p. 413.

[7] Huene, F. v., Kurze Mitteilung über Perm, Trias u. Jura in New Mexico, Neues Jahrb. für Min., etc., Beilage Band 32, 1911, pp. 730–738, pl. 32.

gistorhinus, *Acompsosaurus*, and *Metoposaurus fraasi*—lived long before the close of the Triassic period and that there was a later vertebrate fauna.

On several occasions the writer has shown that some of the Parasuchians found in Wyoming and Arizona are of a very primitive type (*Palaeorhinus*, *Angistorhinus*), others less so, as *Machaeroprosopus* and *Heterodontosuchus*. It seems questionable whether the European genus *Phytosaurus* does not also occur here. The Labyrinthodonts all belong to the family Metoposauridae, which in Europe is of lower Keuper age. *Acompsosaurus*, as shown elsewhere,[8] is probably nearly related to the primitive parasuchian *Desmatosuchus*, and is not a Pelycosaurian.

At Morrison, near Denver, Colo., the Red Beds fall into three divisions. At the base is the coarse-grained Fountain formation, to which belong the fantastic, nearly perpendicular pillars of red sandstone in the "Garden of the Gods," near Colorado Springs, and in "Rocksbury Park," near Morrison; in the middle is the Lyons formation, to which belong the white quartzitic sandstones ("Creamy sandstones"), which are clearly visible in the landscape; and the uppermost beds, the Lykins formation, consisting of soft reddish and whitish beds, of which Williston's *Hallopus beds* near Canyon City form the upper part.[9] These directly underlie the Upper Jurassic Morrison beds. The Fountain formation is now accepted as being good Pennsylvanian;[10] Lyons sandstone, as Pennsylvanian; lower Lykins, as Permian; upper Lykins, as Triassic, and more or less an equivalent of the Chugwater formation of Wyoming.

Farther to the northwest in the region of Lander, Wyo., below the Oxfordian marine Jurassic Sundance beds (with *Belemnites*, *Gryphaea*, and *Baptanodon*), are red beds, usually designated the Chugwater formation, nearly 300 meters in thickness, in whose upper 70 meters, the "Popo Agie beds," a number of vertebrates have been found, and more recently some unios and plants described by E. W. Berry.[11] The Popo Agie beds are apparently equivalent to Knight's Jelm formation[12] of southern Wyoming and are clearly separated from the overlying marine Jurassic (Sundance) beds and the underlying red beds. From a paleontological standpoint, the writer is forced to consider the fauna of the Lander as being of the same age as the lower fauna of the Colorado Plateau. Both must be Middle Triassic. From the literature and from personal observation, it is thought that the geological data are not adverse to this conclusion. Parasuchians such as *Palaeorhinus* and *Angistorhinus*,

[8] Gondwana—Reptilien in Südamerika. Pal. Hung. 1926

[9] Williston, S. W., Journ. Geology, vol. 13, 1905, pp. 338–350.

[10] J. Henderson, Colorado Geol. Surv., Bull. 17, 1920.

[11] Journal of Geology, vol. 22, 1924, pp. 488–497.

[12] Knight, S. H., Geol. Soc. America, Bull., vol. 28, p. 168, 1917.

having a supratemporal fenestra with a high posterior border, are relatively primitive and could not possibly be of Upper Triassic age; also *Acompsosaurus* and *Desmatosuchus*, which have still more primitive characters, could hardly be expected in Upper Triassic beds. *Metoposaurus*, *Anaschisma*, and *Buettneria* must be Middle Triassic forms. They are closely related and *Metoposaurus* does not occur in Europe later than lower Keuper. Some plants and some fishes of these beds are related to those of the Atlantic coast.

FOSSILS FROM THE TRIASSIC OF CENTRAL AND WESTERN REGIONS

A. Fossils of probable Middle Triassic age:

Wyoming.—Near Lander (Willow Creek) and Wind River in the Popo Agie beds of the Chugwater formation—

Palaeorhinus bransoni Williston.
Angistorhinus grandis Mehl.
Angistorhinus gracilis Mehl.
Dolichobrachium gracile Williston.
Eubrachiosaurus browni Williston.
Brachybrachium brevipes Williston..
Anaschisma browni Branson
Anaschisma brachygnathum Branson

Colorado.—Purgatoire River, in first exposure south of Bent Canyon, near Las Animas: Fragments of a large Parasuchian skull.

Eighteen miles east of Canyon City: Parasuchian fragments.

San Miguel River in sandy conglomeratic rock: Parasuchian tooth.

Silver Creek, north of Rico Mountains, at entrance of small gulch at 3,260 meters' elevation: Fragment of Parasuchian jaw with alveoli.

Utah.—Clay Hill near San Juan River: *Heterodontosuchus ganei* Lucas.

Canyon of Grand River near Moab, above Ferry, 30 miles below base of Vermillian Cliff sandstone in a conglomerate which lies unconformably above the underlying beds: Fragmentary bone.

Arizona.—Near Tanners Crossing and Holbrook, Little Colorado River—

Angistorhinus, species?
Machaeroprosopus validus Mehl.
Machaeroprosopus, species.
Heterodontosuchus ganei Lucas.
Placerias hesternus Lucas.
Metoposaurus fraasi Lucas.

Adamana: Parasuchian teeth and bones, among them being *Palaeoctonus orthodon* Cope and *P. dumblianus* Cope.

Near Fort Wingate and Petrified Forest:

Palaeorhinus (aff.) *bransoni* Williston.
Acompsosaurus wingatensis Mehl.

New Mexico.—Arroyo Seco, west of Abiquiu: *Machaeroprosopus bucceros* Cope.

Mesa Poleo, 40 kilometers southwest of Albiquiu: Fragments of Parasuchians and Stegocephalians.

Laguna: Fragments of Parasuchians and Stegocephalians.

Santa Rosa: Fragments of Parasuchians and Stegocephalians.

Twenty kilometers northwest of Cobra Springs: Fragments of Parasuchians.

Forty-five kilometers south of Tucumcari: Parasuchian bones.

West of San Juan: Parasuchian bones.

A. Fossils of probable Middle Triassic age—Continued.

Texas.—Sand Creek, Holmes Creek, and east bank of Blanco River near Spur, Crosby County—

Desmatosuchus spurensis Case.
Promystriousuchus oehlersi Case.
Leptosuchus crosbyensis Case.
Many Parasuchian bones.
Metoposaurus jonesi Case.
Buettneria perfecta Case.

B. Fossils of certain Upper Triassic age, from beds at Cerro Blanco, near Gallina, New Mexico:

Episcoposaurus horridus Cope.
Typothorax coccinarum Cope.
Gen. undet. *scolopax* Cope.
Coelophysis longicollis Cope.
Coelophysis bauri Cope.
Coelophysis willistoni Cope.

C. Fossils of uncertain level but thought to be Upper Triassic:

Arizona.—Near Tanners Crossing, Little Colorado River, in Yellow argillaceous sandstone—

Episcoposaurus horridus Cope.
Typothorax coccinarum Cope.
Three small saurischian vertebrae.

Texas.—West side of Blanco River, Crosby County—

Typothorax, species.[13]
?"*Phytosaurus*" *doughti* Case.
?"*Phytosaurus*" *superciliosus* (Cope).
?"*Episcoposaurus*" *haploceras* Cope.
"*Coelophysis*," species.[13]

The Middle Triassic fauna (*A*), with many primitive Parasuchians and some Labyrinthodonts but very few other forms, is distributed through Wyoming, Colorado, Utah, Arizona, New Mexico, and western Texas. The Upper Triassic fauna (*B*), as characterized by *Typothorax*, *Episcoposaurus*, and *Coelophysis*, has only been found high above Poleo sandstone (—Shinarump conglomerate). Probably the same and similar fossils in Arizona and Texas belong to an equivalent horizon.

II. *Atlantic coast region*.—Triassic deposits to an enormous thickness are lying discordantly upon ancient rocks along the east slope of the Appalachians. According to Lull, they are more than 4,000 meters thick in Connecticut and Massachuetts. Near the base of the upper half they are divided by three great seams of diabase which lie nearly horizontal with vertical thicknesses up to 400 meters. In the Connecticut basin, near the upper limit of the lower part—that is, below the so-called "anterior trap sheet"—there have been found the following Parasuchians: *Rutiodon* (?) *validus* Marsh, *R*. (?) *manhattanensis* Huene, and *Stegomus arcuatus* Marsh. Tracks have not yet been found there. They occur for the first time between the

[13] Case, E. C., Pub. 321, Carnegie Institution of Washington, 1922, p. 81, fig. 31.

"anterior" and the "main trap sheet," but become more abundant above the latter, and attain their greatest abundance above the uppermost trap sheet—the so-called "posterior trap sheet." Only in these highest beds are found the well-known Saurischia: *Anchisaurus colurus* Marsh, *A. solus* Marsh, *Thecodontosaurus polyzelus* (Cope), *Ammosaurus*, *Podokesaurus holyokensis* Talbot, and the Pseudosuchian *Stegomosuchus longipes* (Emerson and Loomis), quite different from *Stegomus arcuatus*. Numerous plants and fishes are found in the "anterior" (lower) and "posterior shales" between the three large trap sheets.

In the southern continuation of the Connecticut basin, through New Jersey, Pennsylvania, Virginia, and North Carolina, a gradual change in the character of the beds takes place. In New Jersey and Pennsylvania the Trias is divided into three groups, at the base the Stockton beds with red and sometimes shaly and argillaceous sandstone from which come the remains of *Rutiodon* (?) *Manhattanesis* (Huene), as published by Sinclair.[14] In earlier times, Lea, Leidy, and Emmons described Parasuchians from these beds. The succeeding beds are the light colored Lockatong sandstones, and above them the Brunswick series. In Virginia and North Carolina the lowest division is often shaly in character and contains large coal seams; the Phoenixville tunnel and Egypt are well-known localities of this kind. Here are found plants, fishes, Labyrinthodonts, and Parasuchians, the last two especially occuring in the lowest strata with the coal beds. In the Connecticut Valley also the Parasuchians are found only in the lower part. Lull's impression is that the Parasuchians and Labyrinthodonts of the southern localities are from lower horizons than the Saurichians of the Brunswick shales of the Connecticut Valley.[15] *Dictyocephalus* from Virginia and North Carolina, a near relative of *Metoposaurus*, must be middle Triassic. The plants, especially abundant in the South, have been compared by Fontaine,[16] and later by Stur[17] and by Ward,[18] with the flora of the "Lettenkohle" from Lunz in the northern Alps, and from Neue Welt near Basel. Jones considers the Ostracods as similar to those of the German Keuper. The rich fish fauna was considered by Agassiz and Newberry as equivalent to that of the upper German

[14] Sinclair, W. J., Amer. Jour. Sci., vol. 45, 1918, p. 457.

[15] Lull, R. S. Triassic life of the Connecticut Valley. Geol. Surv. Connecticut, Bull. No. 24, 1915, p. 80.

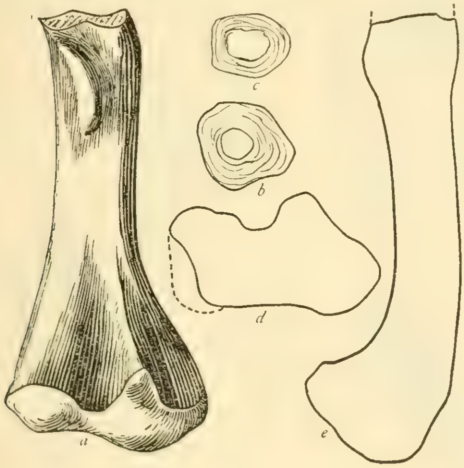
[16] Fontaine, W. M. The older Mesozoic floras of Virginia. U. S. Geol. Surv., Monogr. 6, 1883.

[17] Stur, D. Lunzer Flora in den older Mesozoic beds of the coal field of eastern Virginia. Verh. k. k. geol. Reichsanst. Wien, 1888, pp. 203–217.

[18] Ward, L. F. Status of the Mesozoic floras of the United States. U. S. Geol. Surv., 20th Ann. Rept., pt. 2, 1900, pp. 211–315.

Keuper, but Eastman,[19] having treated the whole fish fauna, and also being familiar with the European fish faunas, considers them as more ancient. He says that several species of *Seminotus* (— *Ischypterus*) are nearly related to those from Perledo and Besano in the Italian Alps, and therefore correlates the fish fauna with the upper Muchelkalk or Lettenkohle.

From all of this it must be concluded that the numerous but not yet sufficiently known Parasuchians and Labyrinthodonts from North Carolina, Virginia, Pennsylvania, New Jersey, Connecticut, and Massachusetts do not belong to the youngest, but to the middle Trias, which would be about the time between upper Muschelkalk and lower Keuper, but that the Saurischians in Connecticut and Massachusetts belong to the upper Keuper or the Rhaetic. This also seems to be the view of Lull, who, in 1915, assembled the American evidence on this question, but without comparing extensively with European evidence.



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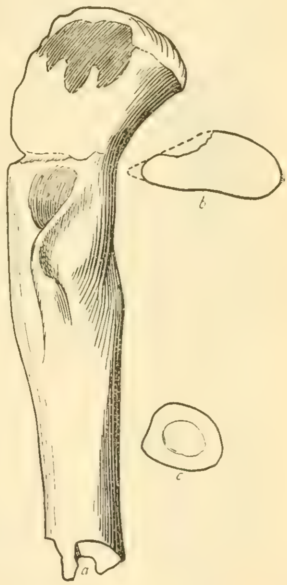

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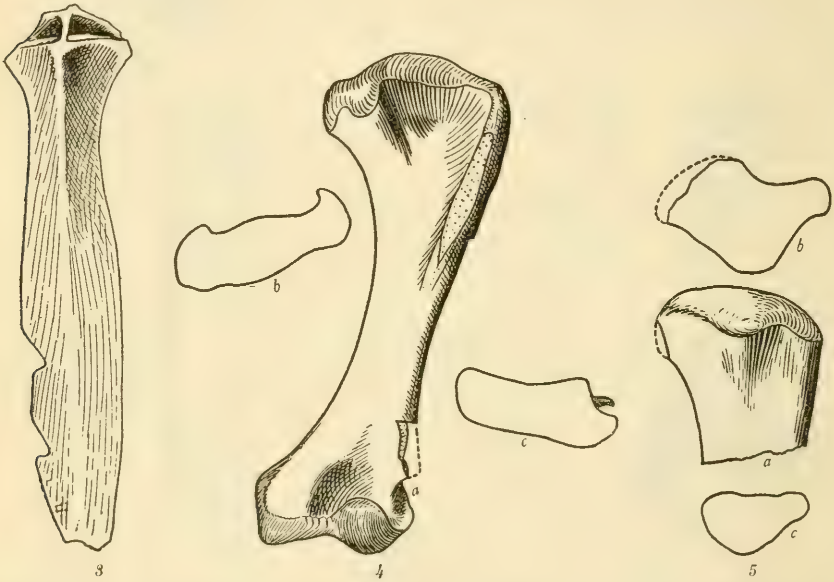
FIGS. 1–2.—1, TYPOTHORAX COCCINARUM (COPE). TRIAS (PROBABLY UPPER), FROM NEAR TANNERS CROSSING, LITTLE COLORADO VALLEY, ARIZ. U. S. NAT. MUS. NO. 5784. RIGHT FEMUR, DISTAL HALF, *a*, FROM BELOW, *b*, SECTION AT UPPER BREAK, *c*, SECTION JUST BELOW TROCHANTER, *d*, OUTLINE AT DISTAL END, *e*, LATERAL VIEW. 2, PROXIMAL EXTREMITY OF ANOTHER RIGHT FEMUR, SAME LOCALITY AS FIG. 1, NO. 2163, U. S. NAT. MUS., *a*, FROM BELOW, *b*, OUTLINE OF PROXIMAL FACE, *c*, SECTION AT DISTAL BREAK. BOTH 1 : 4 NAT. SIZE.

[19] Eastman, Charles. The Triassic fishes of New Jersey. Ann. Rep. Geol. Surv. New Jersey for 1904 (1905), pp. 70–72; Triassic fishes of Connecticut. Geol. Surv. Connecticut, Bull. 18, 1911, pp. 23–26.

It is evident that these continental Triassic deposits comprise a long period, the close of which about coincides with the close of Triassic time, and whose middle and older part is about a parallel of the German "Lettenkohle." The beginning of these deposits is probably at least in the time of the earlier or later Muschelkalk.

From these considerations it seems that in the eastern Trias the equivalent of the lowest Trias is missing, and even in the central and western continental Trias such equivalents are at least not shown. Only middle and Upper Triassic deposits are evident, as has also been shown in *Neue Beitrage zur Kenntnis der Parasuchier.*[20]



FIGS. 3–5.—3, INTERCLAVICLE OF A PARASUCHIAN. MIDDLE TRIAS FROM NEAR TANNERS CROSSING, LITTLE COLORADO VALLEY, ARIZ. U. S. NAT. MUS. NO. 2153. VIEW FROM BELOW. 4, LEFT HUMERUS OF A PARASUCHIAN, SAME LOCALITY. U. S. NAT. MUS. NO. 2154, *a*, FROM IN FRONT, *b*, FROM ABOVE, *c*, FROM BELOW. 5, LEFT FEMUR, WITHOUT DISTAL END OF A PARASUCHIAN, SAME LOCALITY. U. S. NAT. MUS. NO. 2163, *a*, FROM BELOW, *b*, OUTLINE OF PROXIMAL FACE, *c*, SECTION IN MIDDLE AT NARROWEST PLACE. ALL FIGURES 1 : 4 NAT. SIZE.

In the Texas Dockum beds is the very primitive *Desmatosuchus* and such more advanced forms as *Promystriosuchus* and *Leptosuchus*. But it is possible that they are not quite of the same age.

A few specimens from the United States National Museum's collections are here figured. They had kindly been forwarded to the writer who wishes to express his thanks.

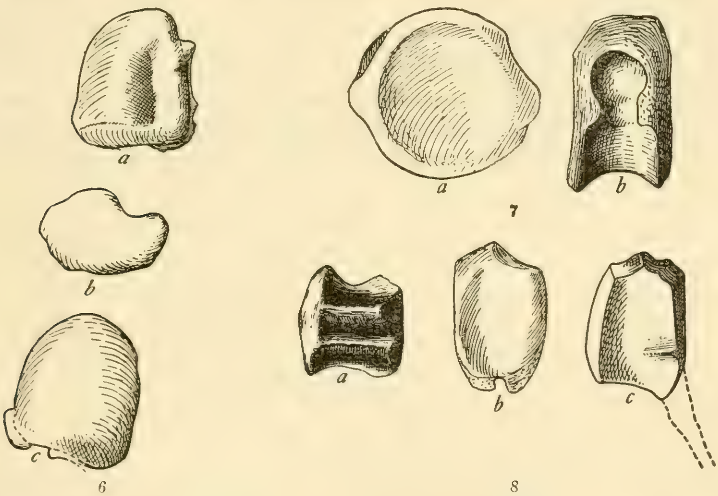
At this time I wish to express my thanks to Dr. J. B. Reeside, of the United States Geological Survey, for the valuable notes and

[20] Jahrb. Preuss. Geol. Landesanst. for 1921 (1922), vol. 42, pp. 49–160.

criticism of the geological portion of this paper, which he so kindly furnished me.

(1) *Typothorax coccinarum* Cope. Right femur in yellow sandy clay, from near Tanners Crossing, Ariz. The proximal extremity has a surprisingly large trochanter minor. Trochanter quartus and distal end are the same as in Cope's type[21] from New Mexico. It probably also belongs to the Upper Trias as in New Mexico. (Cat. No. 5784, U.S.N.M.)

(2) Parasuchian bones. There are a number from Tanners Crossing, Ariz., belonging to the Middle Triassic fauna. Among these is a good interclavicle (Cat. No. 2153, U.S.N.M.), a fair humerus (Cat. No. 2154, U.S.N.M.), a complete ulna (Cat. No. 2154, U.S.N.M.), and a femur lacking only the distal end (Cat. No. 2163, U.S.N.M.).



FIGS. 6–8.—6, PROBABLY RIGHT ASTRAGALUS OF A PARASUCHIAN. MIDDLE TRIAS FROM NEAR TANNERS CROSSING, LITTLE COLORADO VALLEY, ARIZ. U. S. NAT. MUS. NO. 2160, *a*, FROM ABOVE, *b*, LATERAL VIEW, *c*, FROM BELOW. 7, DORSAL VERTEBRA OF A STEGOCEPHALIAN (METOPOSAURID), SAME LOCALITY. U. S. NAT. MUS. NO. 2158, *a*, FROM IN FRONT, *b*, FROM RIGHT SIDE. 8, CAUDAL VERTEBRA OF A STEGOCEPHALIAN (METOPOSAURID). U. S. NAT. MUS. NO. 2158, *a*, FROM BELOW, *b*, FROM BEHIND, *c*, FROM LEFT SIDE. ALL FIGURES 1 : 2 NAT. SIZE.

One of these bones could possibly be an astragalus; if so, it is the first known Parasuchian astragalus. It is flat, rounded below, and blunt on the lateral side. Above it is excavated along the anterior border in a narrow strip, and the larger posterior part forms a curved elevation. From the known distal end of the tibia[22] this form of astragalus was to be expected. It would fit better with *Episcoposaurus* than with *Phytosaurus* or *Mystriosuchus* (Cat. No. 2160, U.S.N.M.).

[21] See Bull. Amer. Mus. Nat. Hist., vol. 34, 1915, p. 485 and following.
[22] Idem., p. 494.

(3) Vertebrae of Metoposauridae from the Middle Trias of Tanners Crossing, Ariz. (Cat. No. 2158, U.S.N.M.). The dorsal vertebrae are broad and with flat and parallel articular faces. The dorsal side shows an inclined anterior and a similar posterior face, and between them a slightly curved or nearly flat transverse strip with no trace of the dorsal sine canal. The attachment of the rib is shown by a thickening of the anterior and the posterior lateral border in their middle height.

A middle caudal vertebra, smaller than the dorsals, is rather narrow. Its articular faces are very slightly converging upward. The upper aspect shows two faces, one inclined anteriorly, the other posteriorly. It is demonstrated more clearly than in the dorsals that this "centrum" is really a hypocentrum. From below it has a very deep median fossa and two high ridges, slowly becoming higher posteriorly, and being broken below the posterior articular face. This is the place where the bifurcated haemapophysis grew out of the hypocentrum; it was not separated from it as in reptiles, but was one single piece. At the posterior border of the hypocentrum and low down there is a small remainder of the attachment of the caudal rib.

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KENTRIODON PERNIX, A MIOCENE PORPOISE FROM MARYLAND

By Remington Kellogg

Of the Bureau of Biological Survey, United States Department of Agriculture

After having recently reexamined the types of the fossil porpoises described from the Miocene formations of Maryland and Virginia, the problem of allocating some of these species arose and this in turn led to a reconsideration of several undescribed specimens in the National Museum. Among Cope's types are two porpoises, *Delphinapterus ruschenbergeri*[1] *and Priscodelphinus stenus*,[2] with vertebrae of approximately the same size as those of the porpoise described in this paper. After some study it was decided that, on the basis of vertebral characters, one of these porpoises may be related or referable to the genus *Delphinodon* and that the other appears to have more features in common with the living genus *Stenodelphis* than with any other porpoise. The vertebrae of these two porpoises have some very distinctive features and it was deemed advisable to discuss them more fully in this connection and to point out the essential peculiarities which seem to distinguish them from those of the porpoise hereinafter described.

DELPHINAPTERUS RUSCHENBERGERI Cope

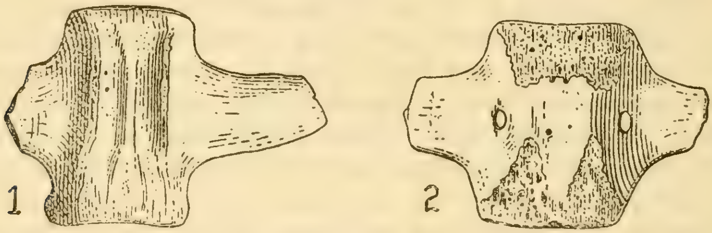
The fossil porpoise *Delphinapterus ruschenbergeri* was based upon a lumbar and a caudal vertebra (Cat. No. 11233, Academy of Natural Sciences of Philadelphia); they may have belonged to a porpoise in the same genus as *Delphinodon dividum*, but this is uncertain. On both of these small vertebrae the basal portions of the comparatively long transverse processes are preserved. The anterior and posterior margins of the right transverse process of the type lumbar are eroded and one can not be certain whether the transverse processes were like those of *Kentriodon* which have expanded extremities or like the attenuate type exemplified by *Delphinodon dividum*. The centra of these vertebrae are long—not short and

[1] Cope, E. D., Second contribution to the history of the Vertebrata of the Miocene period of the United States. Proc. Acad. Nat. Sci. Philadelphia, vol. 20, p. 189. July, 1868.

[2] Cope, E. D., Idem., p. 188.

deep as in corresponding vertebrae of *Stenodelphis* and other living porpoises. There is also a longitudinal carina on the concave floor of the neural canal, like on the lumbars of *Delphinodon dividum*. That this lumbar is an anterior one is shown by the width of the neural canal and the anteroposterior diameter of the neural arch at the base.

If any reliance can be placed upon the proportions of the transverse processes, then the caudal also is an anterior one. No importance is attached to the perforation of the transverse process at the base, because in the caudal vertebrae of *Phocaena phocoena* the foramen is very variable in its appearance. Skeletons were examined in which the second caudal was the first with the transverse processes perforated at the base; on others it was the third, fourth, or



FIGS. 1–2.—1, DORSAL VIEW OF TYPE LUMBAR OF DELPHINAPTERUS RUSCHENBERGERI COPE. 2, VENTRAL VIEW OF TYPE CAUDAL OF DELPHINAPTERUS RUSCHENBERGERI COPE × ⅔. (AFTER CASE)

even the fifth, and in one instance it was the seventh. In case of another porpoise, *Neomeris phocaenoides*, the eighth caudal was the first with the transverse processes perforated at the base. On the fossil caudal there is a depression above the transverse process, but not below. The inferior surface of the centrum is eroded at both ends, which accounts for the absence of the facets for the chevron bones. The transverse processes are relatively very narrow.

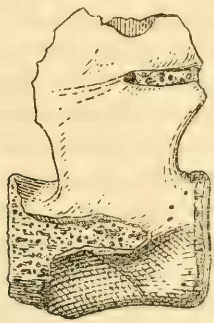
For their position in the series, both vertebrae are very long as compared with any of the living Delphinidae and are in that respect most like those of *Kentriodon*. In other respects, as has been pointed out in the foregoing remarks, these two vertebrae are so unlike those of *Kentriodon* that the writer has no hesitancy in stating that they belong to a quite different type of porpoise.

Measurements of the type vertebrae (in millimeters)

	Lumbar	Caudal
Length of centrum	45	41
Breadth of anterior face of centrum	26	31
Height of anterior face of centrum	22	27
Anteroposterior diameter of base of transverse process	25	26
Length of base of neural arch	28	29 (?)
Breadth of neural canal	11	4
Distance between perforations at base of transverse processes	—	23

PRISCODELPHINUS STENUS Cope

Cope says that he had two lumbar vertebrae of the fossil porpoise *Priscodelphinus stenus*, but only one (Cat. No. 11240, Academy of Natural Sciences of Philadelphia) was found and this vertebra was figured by Case.[3] This is a small vertebra with a very thin anterior epiphysis, broad neurapophysis, and a thin-edged inferior longitudinal carina; the posterior epiphysis is missing. In general appearance this vertebra resembles the third or fourth lumbars of *Stenodelphis*. It is characterized by the unusual proportions of the base of the neural spine, the anteroposterior diameter being proportionately greater than on the corresponding vertebra of any porpoise of the same size known to the writer. The nearest approach to this type of neural spine is found in the lumbars of *Stenodelphis*,



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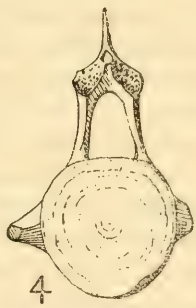

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Figs. 3–4.—3, Lateral view (right side) of type lumbar of Priscodelphinus stenus Cope. × ⅔. 4, Anterior view of type lumbar of Priscodelphinus stenus Cope. × ⅔. (After Case)

a living porpoise of approximately the same size. When complete the neural spine was several millimeters broader anteroposteriorly at the base, for the thick posterior border has suffered from erosion or breakage. The posterior face of the centrum is flat, with a large central pit and about 14 ridges radiating from it. The anterior epiphysis is depressed centrally. The posterior end of the centrum is lower than the anterior, a modification also present in the lumbars of *Kentriodon*. Superiorly the sides of the centrum are flat and inferiorly they are concave, a condition which is traceable to the presence of a narrow diagonal groove on each side of the longitudinal inferior carina. Each of these diagonal grooves terminates mesially anterior to the middle of the centrum and extends backward and upward to the posterior margin of the basal portion of the transverse process. The remnants of the metapophyses indicate that they were more prominent than in *Stenodelphis*. Although the transverse processes are broken off at the base, they agree with those

[3] Case, E. C., Miocene Atlas, Maryland Geological Survey, Baltimore, pl. 13, figs. 1*a*, 1*b*, 1904.

of *Stenodelphis* in their anteroposterior diameter. So far as the present evidence goes, there are adequate reasons for considering that the peculiarities of the type lumbar of *Priscodelphinus stenus* indicates the presence of a porpoise in the Maryland deposits whose skeleton will be found to possess vertebrae of a type not unlike those of *Stenodelphis.*

Measurements of the type vertebra (*in millimeters*)

Length of centrum	39.4
Breadth of centrum	26
Height of centrum	26
Minimum anteroposterior diameter of neurapophysis	25
Breadth of neural canal	11.6
Distance between superior margin of metapophysis at base and top of centrum	16.4

Four other species, *atropius*, *conradi*, *harlani*, and *spinosus* are referred to *Priscodelphinus* in the article in which *stenus* is described. Cope subsequently withdrew four of these five species from the genus *Priscodelphinus.* In 1875, Cope[4] referred *Priscodelphinus stenus* to his genus *Belosphys.* Fifteen years later when Cope[5] published a list of the extinct Cetacea of North America, he again changed the generic position of this species and referred it to *Ixacanthus.* The species *stenus* has remained in the genus *Ixacanthus* since that time.

To summarize briefly the evidence in favor of the assumption that this porpoise represents an undescribed form, it might be pointed out that the transverse processes of the type caudal of *Delphinapterus ruschenbergeri* are too slender to indicate any close relationship and that the anteroposterior diameters of the neural spine, neural arches, and transverse processes (at the base) of the type lumbar of *Priscodelphinus stenus* are relatively greater. It is believed that these differences are of sufficient importance to justify the application of another name to the porpoise hereinafter described.

KENTRIODON, new genus[6]

KENTRIODON PERNIX, new species

INDIVIDUAL I

Type specimen.—Cat. No. 8060, Division of Vertebrate Palaeontology, United States National Museum. When this specimen was received at the museum, it was seen that the skeleton was fairly complete, with the skull, mandibles, cervical and dorsal vertebrae in their

[4] Cope, E. D., Synopsis of the Vertebrata of the Miocene of Cumberland County, New Jersey. Proc. Amer. Philos. Soc., vol. 14, p. 363. 1875.

[5] Cope, E. D., The Cetacea. American Naturalist, vol. 24, No. 283, p. 615. July, 1890.

[6] Κέντριον, diminutive of Κέντρον, prickle or spike; ὀδών=ὀδοῦς, tooth—in allusion to the pair of elongated teeth at the extremity of the rostrum and mandibles; *pernix*, swift or nimble.

natural positions. The skeleton was prepared in relief for exhibition and the elements lie in the position in which they were at the time they were buried by sediments. The porpoise lies on its left side and the vertebrae are in sequence from the atlas to the fifth lumbar. The vertebral column is not complete, but 7 cervicals, 10 dorsals, 4 lumbars, and transverse processes of 3 others, and 10 caudal vertebrae and an epiphysis of another, as well as 4 chevrons, are present. The vertebral column of this porpoise appears to consist of 48 vertebrae, divided as follows: 7 cervical, 10 dorsal, 10 (?) lumbar, and 21 (?) caudal vertebrae. On the right side there are 6 ribs in regular sequence and articulated with their respective vertebrae: 4 additional ribs lie on the right side of the vertebral column. On the left side, 10 ribs are present, but most of them are incomplete. With the exception of the posterior half of the left scapula and the proximal epiphysis of the right humerus, all of the bones of the fore limbs are missing. The skull is essentialy complete, but is crushed slightly; a relatively small number of the teeth are missing. Both mandibles, and both tympanic bullae and periotics are present. The right thyrohyal of the hyoids is preserved. This specimen appears to be immature for reasons hereinafter mentioned.

Locality.—The occurrence is as follows: Near Latitude 38° 40′ north, and longtiude 76° 32′ west, on the western shore of the Chesapeake Bay, approximately 1.5 miles south of Chesapeake Beach, Calvert County, Maryland. Shown on the Patuxent quadrangle or Patuxent folio, No. 152, United States Geological Survey.

Horizon.—This specimen was discovered and excavated by Norman H. Boss on July 5–7, 1913. It was dug from the face of the cliff about 5 feet above beach level in the greenish sandy clay of Shattuck's zone 5 of the Calvert Miocene formation of Maryland.

INDIVIDUAL II

Referred specimen.—Cat. No. 10670, Division of Vertebrate Paleontology, United States National Museum. The second specimen referred to this species consists of an imperfect and slightly crushed skull, with the extremity of the supraorbital process of the left frontal and overlying plate of the maxilla, as well as the left zygomatic process missing; both pterygoids are damaged. All of the teeth with the exception of three, both mandibles, and both tympanics and periotics are missing. This skull belonged to a mature individual.

Locality.—The occurrence is as follows: Near latitude 38° 40′ north, and longitude 76° 32′ west, on the western shore of the Chesapeake Bay, south of Chesapeake Beach, Calvert County, Maryland. Shown on the Patuxent quadrangle or Patuxent folio, No. 152, United States Geological Survey.

Horizon.—This skull was discovered and excavated by William Palmer during July, 1918. It was dug from the face of the cliff about 3 feet below the level of the oyster shells (*Ostrea percrassa*) in the bluish sandy clay of the upper part of Shattuck's zone 3 of the Calvert Miocene formation of Maryland.

Most of the characteristic porpoises which frequented the seas along the Atlantic Coast of North America during Miocene times disappeared from these waters near the close of that period, for they are not known from subsequent formations, and other species which were developing elsewhere took their places in the pelagic faunas of succeeding geological periods. We have no evidence that the fossil porpoise here described is ancestral to living propoises, like *Lissodelphis*, *Delphinus*, *Steno*, and *Prodelphinus*, but there is a marked resemblance between this fossil species and the living *Sotalia*. This fossil propoise undoubtedly belongs in the family Delphinidae, although it should not be placed in the same section with *Delphinus* and *Steno*, but rather with *Sotalia*. It does not represent, however. an intermediate stage between *Sotalia* and any other known fossil porpoise. The skeleton of this porpoise was approximately 5½ feet long.

The graceful undulating movements of some of the smaller Delphinidae are familiar to all who have observed a shoal of these animals in pursuit of a school of fish. The individuals in a shoal of porpoises often swim in a line one before another, never showing at the surface more than the dorsal fin and a small portion of their backs. At times they spring from the water and leap a considerable distance. The skeletons of the Miocene porpoises, *Delphinodon dividum* and *Kentriodon pernix*, resemble those of some of the smaller living porpoises very closely, and it is not unlikely that they were as active and as graceful as any of the living types. Judging by the skeletons of the fossil porpoises which are more or less fully known, there has been a tendency toward greater progressive changes in the structural modifications of some types than in others. In general these modifications have facilitated feeding and swimming. Less progressive, less active, and less plastic species of several types, particularly *Squalodon*, frequented the Miocene Chesapeake estuary at the same time as *Delphinodon dividum* and *Kentriodon pernix*. More highly modified and possibly more active species, like *Zarhachis flagellator*, *Eurhinodelphis bossi*, and *Schizodelphis crassangulum* also entered the same estuary.

Fish-eating porpoises predominate among the living Delphinidae, but there are some that feed largely on cuttlefish, squids, and crustaceans. That these Miocene porpoises differed from one another in their feeding habits is suggested by the modifications observed in the

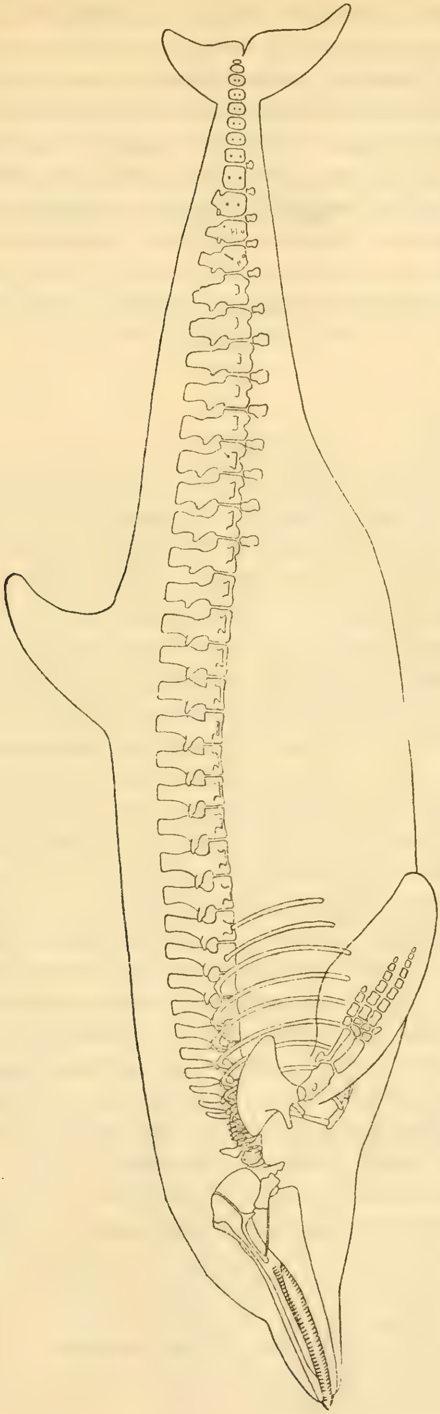


FIG. 5.—RESTORATION OF KENTRIODON PERNIX, ESTIMATED AS 5½ FEET IN LENGTH, A SMALL PORPOISE OF APPROXIMATELY THE SAME SIZE AS THE LIVING SOUTHERN PORPOISE, SOTALIA. THE BODY OUTLINE IN THIS RESTORATION IS HIGHLY CONJECTURAL

position and extent of the glenoid articular surface on the zygomatic process, the relative lengths of the upper and lower jaws, and the differences in the shape and proportions of the teeth. As a rule the progressive types of porpoises possess more simplified teeth and have a shorter and more compact cervical series than the generalized types. The cervical series is relatively short in both *Delphinodon dividum* and *Kentriodon pernix*, and the centra are short and flat. In case of *Delphinodon dividum*, the teeth are relatively large, with rugose enamel on the crown, and accessory cusps on the posterior ones; *Kentriodon pernix*, on the other hand, has slender teeth, with smooth enamel on the crown, but no accessory cusps were noted on any of the teeth.

SKULL

Aside from a narrower brain case and a more slender rostrum, the skull of *Kentriodon pernix* differs from that of *Delphinodon dividum* [7] in having approximately 40 teeth in the upper jaw and 38 in the lower whereas in *D. dividum* there are not more than 27 teeth in the upper jaw and 26 in the lower. With regard to the proportions and relations of the bones on the top of the brain case, the skull of *Kentriodon pernix* appears to agree more closely with the skull of *Acrodelphis* (*Phocaenopsis*) *scheynensis* (Du Bus) figured by Abel [8] than with any other Upper Miocene porpoise known to the writer. The skulls of *Kentriodon* and *Acrodelphis* resemble each other in the shape and proportions of the vertex, the form of the nasal bones, the relative size of the posterointernal angle of the frontal exposed on the vertex, the interval which separates the posterointernal angles of the cranial plates of the maxillae, the relations between the posterior extremities of the premaxillae and the nasal bones, and the curvature of the transverse crest of the supraoccipital. There are features, however, which indicate that these two fossil porpoises represent different types and of these the peculiarities of the premaxilla, particularly the greater width of this bone at the level of the antorbital notch in *A. scheynensis*, are the most obvious. If *Phocaenopsis scheynensis* actually belongs in the genus *Acrodelphis*, then *Kentriodon* also differs from that porpoise in the shape of the mandibles and the length of the symphysis.

The skull of *Kentriodon pernix* is of approximately the same size and the dental formula is similar to *Delphinavus newhalli*,[9] but Pro-

[7] True, F. W., Description of a new fossil porpoise of the genus *Delphinodon* from the Miocene formation of Maryland. Journ. Acad. Nat. Sci. Philadelphia, ser. 2, vol. 15, pp. 165–194, pls. 17–26. December 9, 1912.

[8] Abel, O., Les odontocètes du Boldérien (Miocène supérieur) d'Anvers. Mèm. Mus. Roy. d'Hist. Nat. de Belgique, Bruxelles, vol. 3, p. 135, text fig. 20 and p. 137, text fig. 21. 1905.

[9] Lull, R. S., Fossil dolphin from California. Amer. Journ. Sci., New Haven, vol. 37, pp. 209–220, text figs. 1–7, pl. 8. March, 1914.

fessor Lull says that the premaxillary bone is toothless. It is not necessary to consider the skull of *Heterodelphis leiodontus* Papp [10] in this connection because the rostrum and mandibles of this porpoise are considerably longer than those of *Kentriodon pernix.*

The similarities and differences observable between the skulls of *Kentriodon pernix* and *Delphinodon dividum* are listed in the following tables for the convenience of those who may be interested in this subject.

Comparison of skulls of Kentriodon pernix and Delphinodon dividum Cope

DORSAL ASPECT

Delphinodon dividum True	*Kentriodon pernix*
Brain case very large, broad, and almost equal in length to rostrum.	Brain case short and narrow, about five-eighths as long as rostrum.
Rostrum relatively short, strongly attenuated, and not constricted at base.	Rostrum relatively long, slender, and slightly constricted at base.
Vertex small, more or less pentagonal..	Vertex small, more or less pentagonal.
Nasals relatively large, anterior margin concave, and depressed anteriorly.	Nasals relatively large, anterior margin deeply notched, and elevated anteriorly.
Apophysis of medium size, not conspicuously produced.	Apophysis large, conspicuously produced.
Antorbital notch shallow.	Antorbital notch deep and narrow.
Maxillary foramina situated anterior to antorbital notches.	Maxillary foramina situated posterior to antorbital notches.
Horizontally expanded cranial plate of maxilla not wider than premaxilla at level of anterior margin of respiratory passages.	Horizontally expanded cranial plate of maxilla wider than premaxilla at level of anterior margin of respiratory passages.
Premaxillae noticeably expanded posterior to antorbital notches.	Premaxillae not noticeably expanded posterior to antorbital notches.
Curvature of transverse crest of supraoccipital regular.	Curvature of transverse crest of supraoccipital irregular.

[10] Papp, C. von, Heterodelphis leiodontus nova forma aus den Miocenen Schichten des Comitates Sopron in Ungarn. Mitteil. Jahrb. Königl., Ungar. Geol. Anstalt, Budapest, vol. 14, Heft 2, pp. 25–60, pls. 5–6, text figs. 1–10, 1905.

Comparison of skulls of Kentriodon pernix and Delphinodon dividum Cope—Continued

LATERAL ASPECT

Delphinodon dividum True	*Kentriodon pernix*
Zygomatic process slender, about one-third as deep as long, and with anterior extremity obliquely truncated.	Zygomatic process robust, about one-half as deep as long, and with anterior extremity squarely truncated.
Temporal fossa much longer than anteroposterior diameter of supraorbital process at orbital border.	Temporal fossa equal to or but slightly longer than anteroposterior diameter of supraorbital process at orbital border.
Posterior extremity of maxilla not in contact with transverse crest of supraoccipital.	Posterior extremity of maxilla in contact with transverse crest of supraoccipial.
Lambdoid crest apparently undeveloped, and hence posterior boundary of temporal fossa is uncertain.	Lambdoid crest well developed, forming posterior boundary of temporal fossa.
Postorbital projection of supraorbital process long and slender.	Postorbital projection of supraorbital process long and slender.
Extremity of rostrum formed by premaxillae and 3 or more of the teeth on each side are lodged in this bone.	Extremity of rostrum formed by premaxillae and at least 8 of the teeth one each side are lodged in this bone.
Rostrum at base about two-fifths as deep as wide.	Rostrum at base about two-thirds as deep as wide.

VENTRAL ASPECT

Delphinodon dividum True	*Kentriodon pernix*
Palatines of large size, in contact along midline, and extend forward beyond level of antorbital notches. Each palatine is characterized by a deep anterolateral emargination and large posterior depression.	Palatines lodged in elongate depressions in front of respiratory passages and extend forward beyond level of antorbital notches.
Inner margins of maxillae diverge at a point 50 mm. in front of antorbital notches, exposing a broad strip of the vomer for a distance of not more than 90 mm.	Inner margins of maxillae slightly separated at a point 60 mm. in front of antorbital notches, allowing axial ridge of vomer to appear between them for a distance of not more than 40 mm.
Palatal surface of each maxilla excavated at base of rostrum, forming a well-defined concavity.	Palatal surface of each maxilla slightly excavated at base of rostrum, but not forming a distinct concavity.
Lachrymal large, extending inward beyond inferior orifice of infraorbital canal, and closely appressed to anterior margin of supraorbital process frontal.	Lachrymal large, extending inward beyond inferior orifice of infraorbital canal, and closely appressed to anterior margin of supraorbital process of frontal.

Comparison of skulls of Kentriodon pernix and Delphinodon dividum Cope—Continued

VENTRAL ASPECT—continued

Delphinodon dividum True	*Kentriodon pernix*
Jugal small, ankylosed to lachrymal posteriorly, and mortised into ventral surface of maxilla internal to antorbital notch; styliform process noticeably enlarged as it approaches body of jugal.	Jugal small, ankylosed to lachrymal posteriorly, and mortised into ventral surface of maxilla internal to antorbital notch; styliform process exceedingly slender, not enlarged as it approaches body of jugal.
Internal surface of each falcate process of the basioccipital characterized by an oblique ridge which extends from near anterior margin to postero-inferior angle.	Internal surface of each falcate process of the basioccipital rather evenly convex, no ridge.
Zygomatic process and glenoid articular facet narrow, but the internal margin is undercut and is set off posteriorly by an excavation on ventral surface of squamosal.	Zygomatic process and glenoid articular facet wider, and the internal margin is strongly undercut and set off posteriorly by an excavation on ventral surface of squamosal.
Not more than 27 teeth on each side; the largest teeth 29 mm. in length and 5 mm. in diameter; the smallest teeth 20 mm. in length and 4 mm. in diameter.	At least 40 teeth on each side, the anterior one noticeably larger than others and projects forward and downward from extremity of premaxilla; the largest teeth 38.3 mm. in length and 3.9 in diameter; the smallest teeth 13 mm. in length and 2.8 mm. in diameter.
Crowns of teeth recurved, with rugose enamel, and a distinct carina on anterior and posterior cutting edges; posterior teeth with one or more accessory cusps; roots slender, gibbous below crown, and have a large dentinal canal.	Crowns of teeth recurved, with relatively smooth enamel, but with neither carinae nor accessory cusps; roots slender, slightly enlarged below crown, and have a small dentinal canal.

Dorsal view.—As seen from the dorsal side the skull (pl. 2) of this porpoise differs markedly from that of *Delphinodon dividum;* the most noticeable peculiarities are its long and attenuated instead of rapidly tapering rostrum, less expanded premaxillae in the region of the respiratory passages, deeper antorbital notches, and narrower cranium, although the horizontally expanded posterior extremities of the maxillæ are relatively wider. The form of the base of the rostrum appears to be quite characteristic, since both skulls exhibit the same peculiarities. In accordance with the usual method of description the rostrum is considered to commence at the antorbital notches which are bounded externally by the broad apophyses of the maxillae. In front of the antorbital notches the exposed portions of the maxillae are somewhat narrower than the premaxillae. The premaxillae are more or less horizontal on the base of the rostrum,

but in front of the antorbital notches they commence to slope more and more from the inner to the outer margin and on the distal one-third of the rostrum are almost vertical; they decrease in breadth but increase in height toward the extremity of the rostum. The inner margins of the premaxillae are almost in contact with one another in front of the respiratory passages for a distance of about 15 mm. and, after spreading apart, gradually converge again up to a point 90 mm. in front of the antorbital notches, and then diverge even more widely than on the basal half of the rostrum. The premaxillae commence to expand horizontally near the middle of the rostrum and attain their maximum breadth at the level of the anterior border of the respiratory passages. Opposite to these passages each premaxilla is raised above the corresponding maxilla and the outer border slopes to the maxillary suture. The posterior extremity of each premaxilla is bluntly acuminate and meets the antero-external face of the five-sided nasal edge to edge. The premaxillary foramina are rather large and are situated posterior to the antorbital notches and anterior to the maxillary foramina. Two narrow grooves lead from each of these premaxillary foramina, one of which extends obliquely forward to the internal margin; the other, a much deeper groove, curves backward and outward and is continued posteriorly for some distance along the external margin of the premaxilla. Anterior to the premaxillary foramen the internal portion of the premaxilla is set off from the external border by the first-mentioned groove; this triangular strip narrows rapidly and finally disappears in consequence of the arching of this bone.

With the exception of a short interval in front of the respiratory passages where the inner margins of the premaxillae are almost in contact, the mesorostral gutter is open for its whole length. On the distal end of the rostrum the premaxillae meet mesially and ventrally in a linear suture and form the floor and sides of the mesorostral gutter; on the proximal half the vomer and premaxillae contribute to its formation. The vomer increases in width from its anterior end to the respiratory passages and near the proximal end of the mesorostral gutter rises to the level of the pluglike presphenoid.

As in the living southern porpoise, *Sotalia tucuxi* (Cat. No. 21499, United States National Museum), the mesethmoid is limited to the mesial longitudinal strip of bone which constitutes the most dorsal portion of the wall between the respiratory passages and the sutures which mark its contact with the laterally placed ectethmoids have disappeared. These sutures likewise disappear with age in living porpoises. A continuous sheet of bone extends upward, overspreading the lower borders of the anterior faces of the nasals and the internal borders of the more or less vertical plates of the frontals,

and closes over the area through which the olfactory nerves originally found passage. The mesethmoid is incomplete but probably did not rise to the level of the premaxillae as on the skull of *Sotalia tucuxi*. This continuous sheet of bone, consisting of the ectethmoids and the mesethmoid, also sheathes the dorsal and the upper halves of the lateral faces of the presphenoid and on the inner wall of each respiratory passages meets the corresponding margin of the troughlike vomer in which the presphenoid rests edge to edge.

A slitlike anterior border for the combined respiratory passages is formed by the close approximation of the internal margins of the premaxillae. As mentioned previously, the premaxillae approximate each other so closely behind the premaxillary foramina that they roof over the mesorostral gutter and conceal the anterior extremity of the presphenoid. The presphenoid appears to be rather porous and forms a plug at the proximal end of the mesorostral gutter, but does not rise to the level of the premaxillae above. This pluglike bone projects above the premaxillae on the skull of *Sotalia tucuxi*.

The maxillae and premaxillae constitute the major portion of the dorsal surface of the skull. The antorbital notches are moderately deep and the rostrum appears to be constricted slightly at the base. For a distance of approximately 50 mm. in front of the antorbital notch the outer margin of the maxilla is rounded off. Farther forward this rounded edge disappears with the lateral compression of the rostrum, and the maxilla appears to be deeper from a side view. As a result of the attenuation of the rostrum, the maxilla decreases in breadth anteriorly and the sides slope obliquely downward. The maxilla is barely visible from a dorsal view on the distal one-third of the rostrum. Posterior to the antorbital notch the maxilla expands horizontally and overspreads the frontal bones; the maximum width is attained opposite to the nasal bones. The posterior margins of the maxillae are in contact with the transverse crest of the supraoccipital and the posterointernal angles curve upward, but do not quite reach the level of the dorsal surfaces of the nasals. The thin platelike posterior extremities of the maxillae and the corresponding underlying lateral extensions of the frontals roof over the temporal fossae. On the second skull (pl. 6) the outer margins of both maxillae are imperfect above the temporal fossae, but are essentially complete on the first skull (pl. 2). As regards curvature each maxilla is somewhat depressed opposite to the nasals and slightly convex above the supraorbital process of the frontal; the concaveness is most evident above the temporal fossa. One large or two small foramina which connect with the infraorbital system are present in each maxilla above the temporal fossa and when two are present the posterior

one is the largest. Behind the antorbital notch one or two maxillary foramina, smaller than those in the premaxillae, open into the shallow grooves which lead forward.

On comparing the dorsal surface of the skull of *Sotalia tucuxi* with that of *Kentriodon pernix*, it was noted that it differed from the latter in that the horizontal cranial plates of the maxillae are relatively wider and that they do not completely sheath the frontals, for there is a narrow strip exposed between their posterior extremities and the transverse crest of the supraoccipital; the brain case is relatively larger and the rostrum is not as slender. Returning again to the skull of *Kentriodon pernix* it may be noted that the horizontal plate of the maxilla does not completely cover the supraorbital process of the frontal, and a narrow strip of the outer margin is exposed above the orbit. In front of the orbit the anteroexternal angle of each maxilla is produced, forming an apophysis. The apophysis of the maxilla is large and broad, projecting beyond the anterior margin of the supraorbital process and overspreading the lachrymal. The lachrymal is closely appressed to the supraorbital process of the frontal and is barely visible from a dorsal view.

From a dorsal view the frontals are largely concealed by the overspreading cranial plates of the maxillae and the slender premaxillae. They are suturally united posteriorly with the supraoccipital, and no trace of an interparietal could be found on either of the skulls. Mesially the frontals meet edge to edge on the vertex and are overspread anteriorly by the nasal bones. The vertex is elevated, relatively small in area, hexagonal in outline, and is formed by the frontals and nasals. On the vertex the posterointernal angle of each frontal is exposed, forming a six sided area of smaller size than the corresponding nasal. Laterally, each frontal sends out a thin platelike extension which underlies the horizontally expanded cranial plate of the maxilla and contributes the roof for the temporal fossa. Farther forward this portion of the frontal is considerably thickened and arched to form a complete osseous roof for the orbit.

The nasals are rather large, more or less six-sided bones which bound the posterior margin of the entrance to the combined respiratory passages. As regards shape, the nasals on both skulls resemble each other so closely that they in conjunction with other features may be said to characterize this species. The anterior margin of each nasal bone is deeply notched and the posteroexternal angle is drawn out into a sharp projection.

Posterior view.—Notwithstanding the distortion produced by the dorso-ventral crushing of the brain case, the original shape of the posterior surface is fairly obvious. The back of the brain case (pl. 3, fig. 1) was inflated, but possibly not as much as in *Sotalia tucuxi*.

The walls of the brain case were too thin to withstand crushing and the supraoccipital bone fractured in many directions. It also buckled backward above the foramen magnum, and the amount of crushing or displacement above the center of the upper margin of this foramen may equal 15 mm. The posterior face of this fossil skull resembles that of *Sotalia tucuxi* more closely than that of *Delphinodon dividum*, but differs from both in that the transverse crest of the supraoccipital is essentially three-sided, the median strip (25 mm.) being coextensive with the vertex at the rear, and each of the lateral strips (46 mm.), which form an obtuse angle with the median strip, are nearly twice as long. In *Sotalia tucuxi* the transverse crest of the supraoccipital is essentially two-sided, with the apex behind the median suture between the frontals.

The supraoccipital is wider than high, more or less hexagonal in outline, but is without a median carina on the upper portion; each lateral lambdoid crest, a continuation of the transverse crest, follows the natural curvature of the posterior end of the temporal fossa. Along the posteroinferior border of the temporal fossa the lambdoid crest overhangs the exoccipital as in *Sotalia tucuxi.*

On the second skull (pl. 3, fig. 1) the paroccipital processes are prolonged downward at least 12 mm. below the level of the inferior borders of the falcate processes. Reversed conditions are found on the skull of *Sotalia tucuxi* where the falcate processes project below the paroccipital processes. In *Sotalia* the external margin of the exoccipital is almost vertical, the ventral angle is blunt and rounded off, and the jugular incisure is broad. Although the outer margin of the exoccipital is incomplete on both sides of this fossil skull, it is evident that it is truncated obliquely, the ventral angle curves inward, and the jugular incisure is deep and narrow. The exoccipitals do not completely conceal the squamosals from the rear.

The foramen magnum is slightly higher than wide. Each occipital condyle is considerably broader near the middle than near the top and tapers rapidly to the lower extremity. The internal margins of the condyles are concave and are sharply defined; the external margins are set off from the surrounding bone by a continuous shallow depression. The articular surface of each condyle curves moderately from end to end and slopes forward from internal to external margin.

Lateral view.—Aside from a slender rostrum and a small brain case, the skull as viewed from the side (pl. 5, fig. 1) is characterized by a more or less rectangular zygomatic process, a large orbit, and the presence of at least 40 slender teeth in each jaw, of which 32 are lodged in the maxilla and 8 in the premaxilla. A tooth much larger than the others projects forward and slightly downward from the

extremity of the premaxilla. In *Sotalia tucuxi*, not more than 2 of the anterior teeth are lodged in the premaxilla. Judging from these two skulls some variation in the relative lengths of the rostra may be expected inasmuch as the measurements show that in case of the first skull (pl. 5, fig. 1) it is equivalent to about three-fifths of the total length while in the second skull (pl. 5, fig. 2) it is almost three-fourths of the total length. As regards relative depth the rostrum agrees with that of *Sotalia tucuxi.* At the base the rostrum is about two-thirds as deep as wide. For approximately 50 mm. in front of the antorbital notch the outer border of each maxilla is rounded off and the upper surface is flat and almost horizontal. Beyond this basal section the slope of the upper surface of the maxilla is from the premaxillary suture to the alveolar margin, becoming steeper as the maxilla decreases in depth and near the extremity is almost vertical. Near the middle of the rostrum the dorsolateral face of the maxilla is deeper than the premaxilla, but from this point forward it gradually diminishes in height while the premaxilla increases. The extremity of the rostrum is formed entirely by the premaxillae. From a lateral view the alveolar gutter is barely visible throughout its length and on the right side terminates 16 to 18 mm. in advance of the antorbital notch. The axis of the rostrum is approximately horizontal and the basicranial axis is bent downward from that of the rostrum.

The anterior margins of the nasal bones are the highest points on the dorsal profile; from these bones to and slightly beyond the antorbital notches, the premaxillae slope strongly downward. The maxillae, on the other hand, slope more gradually from the transverse crest of the supraoccipital to the base of the rostrum.

On its external border the supraorbital process of the frontal is rather thin. The anterior angle or preorbital process is a slight enlargement, about 14 mm. in depth, but the posterior angle or postorbital projection is prolonged downward, forming a slender projection which did not come in contact with the zygomatic process. As a result of crushing in a dorsoventral direction, the postorbital projection on the second skull (pl. 5, fig. 2) was appressed to the anterior face of the right zygomatic process, while the first skull (pl. 5, fig. 1) was crushed in a more oblique direction and an interval of 20 mm. separates the above-mentioned processes on the right side. The maximum length of the right supraorbital process of the first skull (Cat. No. 8060) is 59 mm. and that for the second skull (Cat. No. 10670) is 60 mm.

The large lachrymal bone is closely appressed to the anterior face of the supraorbital process and is overspread above by the apophysis of the maxilla. Below the antorbital notch the small wedgelike jugal

is fused posteriorly with the lachrymal and its basal portion is deeply mortised into the maxilla. An extremely slender and almost threadlike styliform process of the jugal extends below the orbit from the antorbital notch to the anterior face of the zygomatic process. On the first skull, the styliform process of the jugal (pl. 4) is preserved in its entirety on the right side, but in consequence of crushing has been slightly displaced from its original position and now rests superimposed upon the coronoid border of the mandible.

Originally the temporal fossa was somewhat smaller than at present (pl. 5, fig. 2) and taking crushing into consideration it is apparent that its maximum length was not much greater than one- and one-half times the length of the orbit. Superiorly the temporal fossa is bounded by the thin platelike lateral extension of the frontal which underlies the maxilla and posteriorly by the lambdoid crest which follows the lateral margin of the supraoccipital. In this fossa the parietal is suturally united anteriorly and superiorly with the frontal, posteriorly with the supraoccipital, and inferiorly with the alisphenoid and squamosal. In shape the parietal bears some resemblance to a boot. It is clearly excluded from the dorsal surface of the skull.

As compared to that of *Delphinodon dividum*, the zygomatic process is shorter and deeper; it is thickened dorsoventrally and the anterior extremity is rather squarely truncated. The ventral margin is more strongly curved than the dorsal; the postglenoid process is short and rounded. The greatest length of the zygomatic process of the second skull (Cat. No. 10670) along the glenoid border is 41.8 mm. and the greatest depth of the anterior extremity is 18.5 mm. The condyles project posteriorly beyond the level of the exoccipitals.

Ventral view.—In addition to those characters which distinguish it from both *Delphinodon dividum* and *Acrodelphis scheynensis* the skull of *Kentriodon pernix* may also be recognized by certain structural peculiarities which can only be seen from a ventral view. Of these the deep elongate depression in front of each respiratory passage for the reception of the palatine, the relative width of the zygomatic process, and the number of alveoli for teeth are probably the most conspicuous. As seen from below the skull of the second individual (pl. 7) differs from *Sotalia tucuxi* mainly in the shape and relations of the lachrymal bone.

Inasmuch as the right mandible is crushed against the palate of the skull associated with the skeleton (pl. 4) it did not appear advisable to attempt any further removal of matrix in order that the ventral surface of the rostrum could be studied. Hence this part of the description will be based on the second skull (pl. 7) with such

additions and corrections as may be ascertained from the portions of the above-mentioned skull already exposed. The ventral surface of the rostrum is formed almost entirely by the maxillae which meet mesially in a linear suture at the level of the anterior margins of the palatines and continue forward in contact for a distance of 45 mm. where they separate to allow the axial ridge of the vomer to appear between them. Something like 32 teeth were lodged in each maxilla and 8 in each premaxilla, of which the most anterior one is greatly elongated and projects forward. The extremity of the rostrum of the second skull is missing and the premaxillae are not visible from a ventral view on that portion of the rostrum which is preserved. The maxillae broaden from their anterior extremities to the antorbital notches. The convexness of the ventral surface of each maxilla between the tooth rows coincides almost exactly with the obliquity of the dorso-lateral surface and the concaveness of the basal portion is coextensive with the rounded outer border. The ventral orifice of the infraorbital canal is bounded by the maxilla and lachrymal.

The lachrymal is elongate, ankylosed to the anterior margin of the supraorbital process of the frontal, and contributes the posterior and outer borders of the ventral orifice of the infraorbital canal; it is sheathed dorsally by the apophysis of the maxilla and is separated by an interval of not more than 9 mm. from the extremity of the orbitosphenoid. In conjunction with the jugal it forms the lower border of the antorbital notch. Below this notch the lachrymal is so intimately fused with the jugal that the exact limits of these two bones can not be determined. As regards shape and relations with the surrounding bones, the lachrymal bears a much closer resemblance to that of *Delphinodon dividum* than to *Sotalia tucuxi*. The skulls of a number of living porpoises, particularly *Steno rostratus*, *Lissodelphis borealis*, and *Delphinus delphis*, all have a lachrymal like that of *Sotalia*, but curiously enough *Phocaena phocœna*, whose skull otherwise is quite unlike these fossils, has a lachrymal of this type.

Fortunately the entire styliform process of the right jugal is preserved on the first skull. (Pl. 4.) The anterior extremity of the jugal consists of a small more or less triangular body, which is deeply mortised into the ventral surface of the maxilla internal to the antorbital notch and its posterior margin is ankylosed to the large lachrymal bone. From the body of the jugal a long slender and almost threadlike styliform process projects backward below the orbit and probably was attached originally by a ligament to the anterior extremity of the zygomatic process.

When the skull of *Kentriodon pernix* is contrasted with skulls of living porpoises, especially *Sotalia tucuxi*, *Lissodelphis borealis*, *Steno*

rostratus, and *Delphinus delphis*, attention is at once directed to the similar relationships existing between the bones surrounding the inferior borders of the respiratory passages. Briefly stated, the relations and structural peculiarities of the palatines, pterygoids, and maxillae appear to be more nearly in agreement with *Sotalia tucuxi* than with any other living porpoise in the family Delphinidae. With the exception of a small fragment of that portion of the thin ascending plate of the palatine which overspreads the pterygoid in front of the supraorbital process, both palatines are destroyed. The sutures which mark the original position of the palatines are well defined and show that they were similar to those of *Sotalia tucuxi*. In the latter each palatine bone overspreads the elongate depression in front of the corresponding respiratory passage and is suturally united anteriorly and externally with the maxilla. Viewed from the side, the palatine is prolonged upward as a thin ascending plate, which overlaps the pterygoid and abuts superiorly against the horizontally expanded cranial plate of the maxilla. This thin ascending plate of the palatine does not appear to have touched the orbitosphenoid as in *Sotalia tucuxi*. When the palatines are in their normal positions the elongate depressions are not exposed to view. In the skull of this living porpoise the palatines meet mesially and project forward beyond the level of the antorbital notches.

Upon comparing the skulls of *Sotalia*, *Steno*, *Lissodelphis*, and *Delphinus* with these two fossil skulls it became apparent that each pterygoid in the latter consisted of a single internal plate, which straddles the external margin of the basisphenoid and internally meets the horizontally expanded extremity of the vomer edge to edge. The anterior extremity of the thin internal plate of each pterygoid curves around the outside of the corresponding respiratory passage, forming that much of the lower border, and unites by suture with the palatine below and the vomer above on the anterior wall of that passage. In *Sotalia tucuxi* the thin internal plate of the pterygoid is continuous anteriorly with a short external reduplication, which in turn united with the above-mentioned thin ascending plate of the palatine. There is a small airspace or sinus between these two plates. No portion of the pterygoid comes in contact with the alisphenoid.

The vomer first makes its appearance on the ventral surface of the skull about 60 mm. in front of the antorbital notches as a narrow ridge separating the inner margins of the maxillae and is exposed to view for a distance of not more than 40 mm. In front of and posterior to this region the inner margins of the maxillae are in contact and exclude the vomer from the ventral surface of the rostrum. The thin keel of the vomer again makes its appearance near the level of the anterior extremities of the palatines and in-

creases in depth posteriorly, attaining its maximum near the center of the respiratory passages. The vomer expands horizontally posterior to the respiratory passages, overspreads the anterior border of the basisphenoid, and externally meets the internal plate of the pterygoid edge to edge. Inferiorly the posterior wall of each respiratory passage is thus lined by the vomer and the internal plate of the pterygoid; the lower external border is formed entirely by the pterygoid and the internal wall by the vomer; the palatine and pterygoid both contribute to the formation of the anterior wall. The construction and relations of the various bones entering into the upper limits of each respiratory passage are discussed in the description of the dorsal surface.

The median region of the basicranium widens posteriorly and is similar in shape to that of *Sotalia tucuxi.* It is bounded on each side by a continuous wall formed by the internal plate of the pterygoid anteriorly and by the falcate process of the basioccipital posteriorly. The surface of the median area between these lateral walls is slightly concave. The basioccipital is a much wider bone than the basisphenoid, but the suture between these two bones is very indistinct. The posterior extremities of the falcate processes are slightly thickened and are rounded off. The occipital condyles are large and are separated mesially by a deep groove. Between the internal margin of the exoccipital and the posterior margin of the laterally placed falcate process of the basioccipital there is a deep jugular incisure for the passage of the blood vessels comprising the so-called "jugular leash." The ectal orifice of the small hypoglossal foramen appears on the posterior face of the exoccipital above the apex of the jugular incisure. The lower border of the exoccipital is prolonged downward and is slightly thickened to form the paroccipital process. In outline the facet on this process is crescentic and is relatively wider than in *Sotalia tucuxi.*

The body of the squamosal overspreads the parietal and appears to be excluded internally from the lateral wall of the brain case, since the lower border of the parietal makes its appearance below and internal to it on the external border of the tympanoperiotic recess. The squamosal, however, is firmly attached to the lateral surface of the parietal and its lateral projection or zygomatic process serves as the articular surface for the condyle of the lower jaw. The glenoid articular surface on the inferior face of the zygomatic process is strongly concave, curving upward and forward. The facet is relatively wider than in *Delphinodon dividum.* The external border of the glenoid facet follows the curvature of the zygomatic process, but the internal margin is set off posteriorly by a rather deep excavation on the squamosal which undercuts the facet to a more noticeable extent than in *Sotalia tucuxi.* This fossil skull agrees with that of

Sotalia tucuxi in the manner in which the ventral surface of the squamosal is excavated and probably also in the shape and direction of the thin projecting falciform process which has been destroyed. This falciform process probably projected inward and forward as in *Sotalia;* between the base of this process and the temporal angle of the alisphenoid is the semiinclosed foramen ovale. The postglenoid process is small and slightly thickened. A narrow deep groove for the external auditory meatus traverses the squamosal behind the postglenoid process. A posteriorly directed process of the squamosal is suturally united with the exoccipital along its posterior border. The periotic was attached by ligaments to the squamosal at the origin of the groove for the external auditory meatus. The tympanoperiotic recess is bounded by the squamosal externally, the exoccipital posteriorly, the falcate process of the basioccipital internally, and by the falciform process of the squamosal anteriorly; the projecting lower border of the parietal, the backwardly projected alisphenoid, and the underlying process of the basioccipital contribute a complete roof for this recess. Unfortunately a portion of the roof of the tympanoperiotic recess has been destroyed on the right side, so it is not possible to check conditions observed in the opposite recess. Nevertheless, the roof of the recess on the right side appears to be normal, without any irregularities produced by crushing, and agrees, furthermore, in all essential details with conditions observable on the skull associated with the skeleton. Probably the most noticeable peculiarity is the large posterior lacerated foramen which measures 9 mm. in diameter; there are no separate compartments for the nerves and blood vessels. The ectal orifice of this foramen is situated fully 28 mm. above the lower margin of the falcate process of the basioccipital. At the base of the falcate process and near the posterior margin of the pterygoid is the small ectal orifice of the canal for the carotid artery. The mandibular branch of the trigeminal nerve issues through a cleft on the posterior border of the alisphenoid and crosses the ventral surface of the latter on its outward course, although the usual groove is poorly defined.

The alisphenoid is a narrow bone which curves outward and upward, and is suturally united with the parietal above, the frontal in front, and on the rear with the squamosal externally and the parietal internally. Farther forward the orbitosphenoid projects obliquely forward and its extremity is applied to the ventral surface of the supraorbital process. As in *Sotalia tucuxi*, the orbitosphenoid forms the lower portion of the anterior wall of the brain case. The sphenoidal fissure appears to have been closed by the overlapping of the orbitosphenoid by the alisphenoid. Comparison with *Sotalia* shows that the optic nerve passed outward through a notch on the posterior border of the orbitosphenoid in both. The outward course of the

optic nerve is marked by a deep groove which traverses the ventral surface of the orbitosphenoid to its extremity. Beyond the orbitosphenoid the optic nerve followed the channel on the supraorbital process of the frontal. The position of the foramen rotundum is uncertain.

Measurements of the skull (in millimeters)

	Cat. No. 8060 U.S.N.M.	Cat. No. 10670 U.S.N.M.
Total length (occipital condyles to extremity of rostrum)	298	318+
Length of rostrum (antorbital notches to extremity)	185	199
Breadth of skull across zygomatic processes of squamosals	x	[1] 142
Height of skull (between inferior margin of falcate process of basioccipital and dorsal surface of nasal bone)	73. 8	85
Height of skull (basisphenoid to nasal bones)	50. 5	61
Greatest breadth of skull across supraorbital processes (anteriorly)	116. 4	[1] 117
Occipito-premaxillary length of skull (posterior margin of maxilla to extremity of rostrum)	277	287+
Greatest distance between outside margins of premaxillae opposite respiratory passages	47	52. 5
Greatest breadth of right premaxilla in front of respiratory passages	22. 5	25. 2
Greatest breadth of right premaxilla at antorbital notch	15. 5	18. 2
Breadth of rostrum at level of antorbital notches	68	65
Greatest breadth of rostrum at anterior extremities of maxillae	17. 5	17. 5
Greatest length of cranial plate of right maxilla	88	90
Greatest width of cranial plate of right maxilla	42. 5	50
Distance between inner margins of maxillae at vertex	25	26. 5
Greatest breadth of supraorbital process of right frontal (preorbital margin to extremity of post-orbital projection)	56	59. 5
Greatest thickness of frontal and maxilla combined on outer margin and near center of orbit	6	6
Maximum width of exposed portions of combined frontals on vertex	23. 5	25. 5
Greatest anteroposterior diameter of exposed portion of right frontal on vertex	14	12. 2
Greatest anteroposterior diameter of right nasal	18. 5	20. 5
Greatest transverse diameter of right nasal	19	17. 2
Least breadth of cranium between temporal fossae	x	88±
Distance from center of transverse crest of supraoccipital to upper margin of foramen magnum	x	58+
Height of foramen magnum (as preserved)	x	21. 5
Width of foramen magnum (as preserved)	23	26. 5
Greatest distance between outer margins of occipital condyles	48	54. 2
Greatest height of right condyle	x	31
Greatest breadth of right condyle	17	21. 2
Greatest length of right zygomatic process	41. 1	41. 8
Greatest length of styliform process of right jugal	60. 4+	x
Greatest distance between outside margins of exoccipitals	108	113. 5
Greatest vertical depth of skull in front of respiratory passages	40	47. 7
Distance across median region of basicranium between posterior extremities of falcate processes of basioccipital	55	60. 3
Distance across median region of basicranium between posterior extremities of internal plates of the pterygoids	x	37. 5
Distance from proximal alveolus to distal alveolus, inclusive, on right side of the rostrum	171. 5	189+

[1] Estimated.

PERIOTIC

Aside from its smaller size, the left periotic (pl. 3, figs. 2–4) differs from that of *Delphinodon dividum* in that the *pars cochlearis* is less expanded horizontally, the *tractus spiralis foraminosus* is longer and the curvature of the spiral is less pronounced, the *fossa incudis* is narrower, the elongate foramen singulare is placed on the rim of the low partition between the spiral tract and the entrance to the *Aquaeductus Fallopii*, and there is a well-defined concavity on the ventral surface of the *pars cochlearis* at the anteroexternal angle. No periotics of the living southern porpoise *Sotalia* were available for comparison. Van Beneden figured two views of the right periotic of *Sotalia guianensis*. Judging from the illustrations used by Van Beneden [11] the periotic of *Sotalia* resembles this fossil periotic rather closely; the configuration of the cerebral surface and the shape of the internal acoustic meatus are similar, but they differ from one another in the positions of the entrance to the *Aquaeductus Fallopii* and the cerebral orifice of the *Aquaeductus cochleae*. Although this periotic is approximately the same size as that of the living porpoise *Prodelphinus malayanus* (Cat. No. 36051, U.S.N.M.), it differs from the latter in several respects, of which the shape of the internal acoustic meatus and the articular facet on the posterior process are probably the most obvious differences.

One characteristic feature of the ventral surface of this periotic (fig. 6) is the shape of the articular facet on the posterior process. This articular facet is deeply concave on the basal portion and the surface slopes from the apex to the internal margin. A few faint shallow grooves may be distinguished on the outer border of this facet, but they gradually disappear as they approach the above-mentioned concavity. The ventrointernal border of the posterior process projects inward and the free edge contributes the floor for the facial canal. The anterior face of the posterior process is excavated; the external face is somewhat flattened; and the posterior face is rather evenly convex.

As regards the ventral aspect of the *pars cochlearis*, there is a much closer resemblance to *Prodelphinus malayanus* than to *Delphinodon dividum*. The continuation of the facet for the accessory ossicle or uncinate process of the tympanic, usually limited to the anterior process, over upon the ventral surface of the *pars cochlearis* is an unusual modification. Nothing quite like this has been noticed on the periotics of living porpoises. The *pars cochlearis* of this fossil periotic also differs from those of both *Prodelphinus malayanus*

[11] Van Beneden, P. J., and P. Gervais, Ostéographie des Cétacés vivants et fossiles, Paris, Atlas, pl. 41, figs. 8, 8*a*, 1880.

and *Prodelphinus longirostris* (Cat. No. 21168, U. S. N. M.) in that the ventral surface is inflated more noticeably between this facet and the fenestra rotunda, forming an indistinct transverse crest, to the outside of which is a shallow concavity which slopes to the fenestra ovalis, and to inside is a slightly convex surface which slopes forward and inward, The fenestra rotunda is a subtriangular in outline and is slightly larger than the fenestra ovalis. A slight swelling is developed on the posterior face of the periotic above the fenestra rotunda which does not appear to have any relation to the aqueduct of the cochlea. The foot plate of the stapes completely fills the ovoidal fenestra ovalis and is held in position by a pair of narrow internal ledges which extend across the anterior and posterior walls, respectively. Within the vestibule are the orifices of three small canals, the largest of which are situated opposite to the epitympanic orifice of the *Aquaeductus Fallopii* and lead to the semicircular canals; the other, a minute orifice, is situated at the posterointernal angle and is the terminus of the aqueduct leading from the foramen singulare. On the internal wall there is a small passage which leads into the scala vestibuli. The epitympanic orifice of the *Aquaeductus Fallopii* is small and the narrow groove for the facial nerve, which leads from it, is sharply defined between the rim of the fenestra ovalis and the projecting ledge for the *fossa incudis*, but posterior to them it follows along the internal face of the posterior process to the posterior angle. A continuous thin-edged crest extending from the epitympanic orifice of the *Aquaeductus Fallopii* to the *pars cochlearis* separates the rim of the fenestra ovalis on outside from the groove for the facial nerve and on the rear from the fossa for the stapedial muscle. The elongate fossa for the stapedial muscle is rather deep, concave from side to

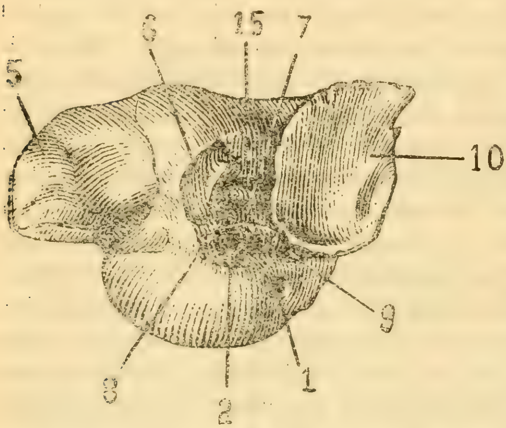


Fig. 6.—Ventral or Tympanic View of Left Periotic of Kentriodon pernix. × 2. Cat. No. 8060, U.S.Nat.Mus. The Same Numbers are Used on Figures 6 and 7 for the Following Structures: 1, Fenestra Rotunda; 2, Fenestra Ovalis; 3, Cerebral Orifice of Aquaeductus Cochleae; 4, Cerebral Orifice of Aquaeductus Vestibuli; 5, Processus Anterior Petrosi; 6, Fossa for Head of Malleus; 7, Semiclosed Canal for Facial Nerve; 8, Epitympanic Orifice of Aquaeductus Fallopii; 9, Fossa for Stapedial Muscle; 10, Processus Posterior Petrosi (Mastoid Process, in Part); 11, Internal Acoustic Meatus; 12, Foramen Centrale; 13, Foramen Singulare; 14, Entrance to Aquaeductus Fallopii; 15, Fossa Incudis

side, and extends downward upon the external face of the *pars cochlearis.* Along the internal margin of this fossa a thin-edged crest is developed on the ventroexternal angle of the *pars cochlearis* which extends backward to the posterior margin. In position and shape the stapedial fossa of this fossil periotic is essentially the same as on the periotic of *Prodelphinus malayanus.* The depth of the posterior face of this fossil periotic (7.1 mm.), as measured from the stapedial fossa to the fossa for the cerebral orifice of the *Aquaeductus vestibuli*, however, is almost twice that of the living porpoise (3.9 m.).

Between the rounded tuberosity or swelling on the basal portion of the anterior process and the anterior margin of the articular facet on the posterior process the ventral surface of the external denser portion of the periotic is deeply excavated. The raised external margin of the *fossa incudis* shuts off this excavation from the epitympanic recess, paralleling *Delphinodon dividum*, but differing from both *Prodelphinus malayanus* and *Prodelphinus longirostris* in this respect, for in these living porpoises the *fossa incudis* is shorter and the excavation or groove is continuous with the surface between the fossa for the head of the malleus and the epitympanic orifice of the *Aquaeductus Fallopii.* The narrow *fossa incudis*, which receives the *crus breve* of the incus, extends the full length of the thin ledge which projects inward below the canal for the facial nerve. The anterior half of the *fossa incudis* is shallowly concave and almost horizontal, but posteriorly it terminates in a small deep pit or ovoidal concavity on the anterointernal angle of the posterior process. The anterior border of the projecting ledge for this fossa is free and above it but external to the epitympanic orifice of the *Aquaeductus Fallopii* is a small depression.

The anterior process is robust, almost triangular in cross section, and is obliquely truncated anteriorly. This process bends inward and is slightly twisted. The main articular surface for the accessory ossicle or uncinate process of the tympanic is a broad ovoidal area which occupies the median portion of the ventral surface of the anterior process. This articular surface curves from end to end and slopes toward the *pars cochlearis.* On the adjoining ventral surface of the *pars cochlearis* there is a circular concavity which is supplementary to the main articular surface on the anterior process. When the accessory ossicle is in position the groove between the anterior process and the *pars cochlearis* is completely closed. On the periotic of *Prodelphinus*, however, a narrow groove is left open between the accessory ossicle and the *pars cochlearis.* The concave fossa for the head of the malleus occupies the internal face of the tuberosity or swelling on the basal portion of the anterior process.

and also extends inward beyond the external margin of the epitympanic orifice of the *Aquaeductus Fallopii.* The posterior surface of the tuberosity slopes much more obliquely than in *Delphinodon dividum.*

In its general features the cerebral face of this periotic (fig. 7) resembles those of *Delphinodon dividum* and *Prodelphinus.* The conformation of the internal acoustic meatus and associated structures are the chief points of difference. This meatus is broadly pyriform in outline, compressed anteriorly, and terminates in the narrow slitlike channel for the passage of the facial nerve. This channel leads to the entrance to the *Aquaeductus Fallopii* and is partially closed by a slender process which projects from the *pars cochlearis.* It is possible that other periotics will be found which will have the cerebral rim of the internal acoustic meatus complete as in *Delphinodon dividum* and the narrow channel for the facial nerve will remain open as in the latter, with the entrance anterior to the meatus. Within the meatus the *Aquaeductus Fallopii* appears to be compressed from side to side. The elongated orifice of the foramen singulare extends practically the full length of the rim on the low partition between the spiral tract and the entrance to the *Aquaeductus Fallopii.* The *tractus spiralis foraminosus* is well defined with a minute foramen centrale at the anterior end, and the spiral is actually longer than in *Delphinodon dividum.*

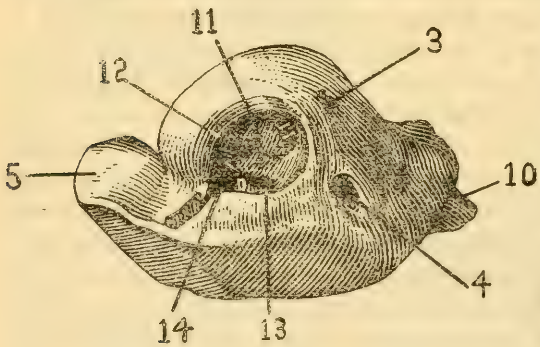


FIG. 7.—INTERNAL OR CEREBRAL VIEW OF LEFT PERIOTIC OF KENTRIODON PERNIX × 2. CAT. NO. 8060, U.S.N.M.

Outside of the internal acoustic meatus and posteroexternally placed is the small orifice of the *Aquaeductus vestibuli*, which opens into a shallow triangular fossa. There is an interval of 3.7 mm. between it and the cerebral orifice of the *Aquaeductus cochleae.* The cerebral orifice of the aqueduct of the cochlea is somewhat larger than that for the vestibule and opens on the posterior face of the *pars cochlearis* at least 2 mm. below the rim of the internal acoustic meatus. On the posterior face of the periotic and above the posterior margin of the stapedial fossa there is a shallow depression which occupies the same area as the slitlike fossa on the periotic of *Delphinodon dividum.*

Measurements of the left periotic (in millimeters)

Breadth of periotic at level of Fenestra ovalis (as measured from external face above groove to internal face of pars cochlearis)	16.9
Greatest length of periotic (tip of anterior process to tip of posterior process)	28.8
Greatest dorsoventral depth of periotic (as measured from most inflated portion of tympanic face of pars cochlearis and groove to most projecting point on cerebral face)	10.5
Distance between Fenestra rotunda and tip of anterior process	16.7
Distance between Fenestra rotunda and tip of posterior process	15.5
Distance between epitympanic orifice of Aquaeductus Fallopii and tip of anterior process	13.4

TYMPANIC

After preparations had been made for the removal of the left tympanic bulla from the mounted specimen for study, it was found that the thin outer lip was badly fractured. The bone was removed as carefully as possible, but unfortunately a few small pieces were missing and no contact could be secured between the sigmoid process, the *processus anterior* of the malleus, and the accessory ossicle or uncinate process with what remained of the thin outer lip. The right tympanic and periotic remain attached to the skull.

On comparing the external surfaces of this tympanic bulla (pl. 1, fig. 3) and that of *Prodelphinus malayanus*, it was interesting to note how differences in proportions modify the general appearance of these bones. It is to be regretted that no comparisons could be made with tympanics of the living porpoise *Sotalia*. According to Van Beneden's figures of the tympanic bulla of *Sotalia guianensis*, the proportions of these bullae appear to be essentially the same when viewed from the external side; the shape of the involucrum is similar and the curvature of the dorsal profile is almost identical. This fossil tympanic bulla is slightly larger than that of *Prodelphinus malayanus*, but the thin outer lip is relatively deeper and the superior border of the lip does not curve inward as abruptly. When viewed from the external side the posterior margin is seen to be less rounded than in *Prodelphinus*, the posterior apophysis is slightly larger, and the tympanic bulla as a whole is relatively deeper. The sigmoid process of this tympanic bulla is not complete, but it is entire on the opposite one; the posterior border and extremity are greatly thickened as in *Prodelphinus malayanus* and the terminal end is twisted at right angles to the basal portion. In front of the sigmoid process there is a distinct crease extending obliquely across the external surface of the thin outer lip from the superior to the inferior margin. The posterior conical apophysis is rather large, but otherwise the

relations between this apophysis and the sigmoid process are essentially the same as in *Prodelphinus malayanus.*

The posterior process is borne on a shorter neck than in *Prodelphinus malayanus* and the articular facet is considerably larger. The wide involuted portion (pl. 1, fig. 4) of the tympanic is depressed below the level of the arching thin outer lip and gradually narrows as it approaches the anterior outlet of the Eustachian canal. The surface of the involucrum (pl. 1, fig. 5) is relatively smooth, convex from side to side, and depressed mesially. The involucrum of the tympanic bulla of *Prodelphinus malayanus* is depressed in front of the posterior process.

The thin outer lip of the left tympanic bulla (pl. 1, fig. 5) is sufficiently well preserved to show the size and direction of the anterior outlet of the Eustachian canal. The anterior end of the bulla is slightly produced, forming a narrow lip which projects forward. The superior border of the thin outer lip of the bulla turns and curves inward, forming a narrow shelf. The accessory ossicle or uncinate process of the tympanic is no larger than that of *Prodelphinus malayanus*, measuring 7.8 mm. in length, 6.5 mm. in width, and 3.8 mm. in depth. The dorsal surface of this ossicle is traversed by a shallow mesial groove which curves from end to end. The internal portion of the accessory ossicle is larger, thicker, and more nearly ovoidal in outline than that of *Prodelphinus malayanus.* The dorsal margin of the thin outer lip of the tympanic bulla is fused with the ventral surface of the accessory ossicle along the external margin of this ovoidal internal structure.

The ventral surface of the tympanic bulla (pl. 1, fig. 2) is slightly depressed mesially. There is a short groove on the anterior end which becomes less distinct as it approaches the mesial depression, but the posterior end is characterized by a large groove which is fully 4 mm. in depth at the posterior margin. When viewed from the ventral face, the inner margin is seen to be biconvex and the outer margin convexo-concave.

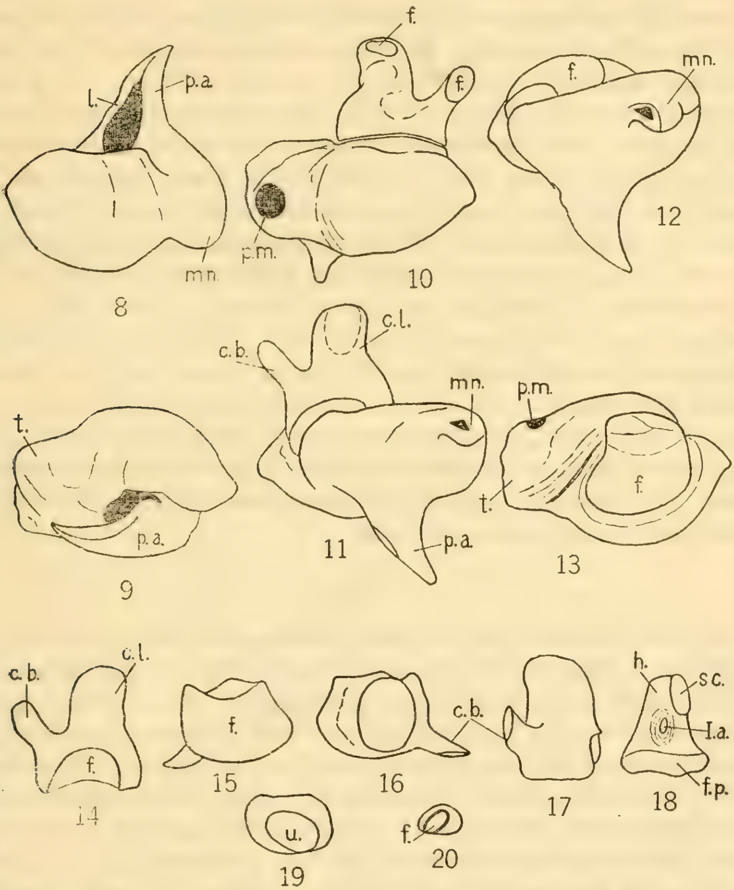
Measurements of left tympanic (in millimeters)

Greatest length of bulla	29.7+
Greatest depth of bulla on internal side (ventral face to dorsal face of involucrum)	9.9
Greatest depth of bulla on external side (ventral face to tip of posterior apophysis)	16.3+
Greatest width of involucrum	9.4

MALLEUS

The head of the left malleus (fig. 12) is of the same form as in *Prodelphinus malayanus* (Cat. No. 36051, United States National Museum) and the upper facet is larger than the lower. These

combined facets articulate with corresponding facets on the incus. A deep groove crosses the head of the malleus (fig. 13) in an oblique direction from the outer to the inner margin, and divides the head



FIGS. 8–20.—LEFT MALLEUS, INCUS, AND STAPES OF KENTRIODON PERNIX. × 5. CAT. NO. 8060. THE SAME ABBREVIATIONS ARE USED ON NUMBERS 8 TO 20 FOR THE FOLLOWING STRUCTURES: *c. b.*, CRUS BREVE; *c. l.*, CRUS LONGUM; *f.*, ARTICULAR FACET; *f. p.*, FOOT PLATE OF STAPES; *h.*, HEAD; *I. a.*, INTERCRURAL APERTURE; *l*, LAMINA; *mn.*, MANUBRIUM; *p. a.*, PROCESSUS ANTERIOR; *P. m.*, PROCESSUS MUSCULARIS; *sc.*, SCAR FOR INSERTION OF STAPEDIUS MUSCLE; *t.*, TUBERCLE; *u.*, UMBO. FIG. 8, EXTERNAL VIEW OF MALLEUS; 9, VENTRAL VIEW OF MALLEUS; 10, DORSOEXTERNAL VIEW OF MALLEUS AND INCUS IN POSITION; 11, VENTROINTERNAL VIEW OF MALLEUS AND INCUS IN POSITION; 12, INTERNAL VIEW OF MALLEUS; 13, DORSAL VIEW OF MALLEUS; 14, VENTRAL VIEW OF INCUS; 15, EXTERNAL VIEW OR BASE OF INCUS; 16, INTERNAL VIEW OR HEAD OF INCUS; 17, POSTERIOR VIEW OF INCUS; 18, POSTERIOR VIEW OF STAPES; 19, VESTIBULAR VIEW OR FOOTPLATE OF STAPES; 20, HEAD OF STAPES

into two surfaces—the tubercle and the combined facets for the incus. The process or tubercle at the anterior end of the head is short and stout, and from it on the internal side arises the manu-

brium. On the dorsal surface of the tubercle (fig. 10) near the anteroexternal angle and at the end of the groove which traverses the malleus in front of the articular facets is a small circular depressed area for the insertion of the tensor tympani tendon. Below and near the anterointernal angle, the manubrium (fig. 11) is represented by a blunt recurved process, pointing downward and backward, and flattened against the side of the malleus. To a small triangular area near the apex of the manubrium was attached the fleshy process (the "triangular ligament" of authors) of the membrana tympani. Some of the fibres of the fleshy process may be attached in the short narrow groove below the manubrium. The manubrium is slightly more developed than in *Prodelphinus malayanus.* In living whales, according to Ridewood, the extremity of the manubrium is attached by fibrous tissue to the middle of the dorsal surface of the tympanic membrane. The head of the malleus is borne on a slender stalk (fig. 8), the processus anterior (longus, gracilis, and folianus of authors), which becomes narrower as it approaches the outer lip of the tympanic bulla, fusing with the latter in the narrow groove between the sigmoid process and the uncinate process. The malleus, including the anterior tubercle, measures 5.8 mm. in length and 4.2 mm. in width.

INCUS

From the position of the articular surface on the head of the malleus, the incus (fig. 11) lies above and internal to it, with the smallest articular facet on the ventral face of the body. Its articular surface has facets divided by a sharp ridge. Two distinct facets comprise the surfaces by which the incus is fitted to the malleus. The largest (fig. 15) of these two facets is shallowly concave, subcrescentic in outline, and is coextensive with the external face or base of the body of the incus; the smallest facet (fig. 14) is deeply concave and is situated at the base on the ventral side. Curiously enough these two facets are quite similar in appearance and shape to those on the incus of *Prodelphinus malayanus.* The body of the incus is feebly developed, being absorbed by the crus longum. The crus breve (figs. 11, 15, 16, 17) is thin, slightly curved, expanded distally, with an elongate facet on the dorsal surface of the apical portion (fig. 10) which rests in the fossa incudis. The crus longum (figs. 14, 17) is not as thick as in *Prodelphinus*, the ventral surface is less convex, and the facet (fig. 10) for articulation with the head of the stapes is small and is situated on the dorsal face near the apex. From the apex of the crus longum to the base of the body the incus measures 3.2 mm. and the greatest diameter of the base is 2.8 mm.

STAPES

The stapes (fig. 18) is of the same form as in *Prodelphinus.* The intercrural aperture is small and connects the relatively large concavities on the opposite sides. A slight side to side movement is permitted when the stapes is in position, but the footplate is closely fitted to the free margin of the fenestra ovalis. The stapes bears on its footplate (fig. 19) a distinct umbo or large oval concavity on the vestibular face. There is a well-defined scar (fig. 18) on the posterointernal angle below the head which seems to mark the attachment of the stapedius muscle, and this portion of the stapes projects slightly. The facet (fig. 20) which marks the point of contact with the corresponding facet on the head of the crus longum of the incus is small and is placed obliquely on the head of the stapes.

MANDIBLES

Minor differences between the mandibles of this fossil porpoise and those of *Sotalia tucuxi* show that too much weight should not be assigned to the general shape for purposes of identification. The mandibles (pl. 4) of this fossil porpoise resemble those of *Sotalia tucuxi* so closely that with the exception of certain points hereinafter mentioned a description of one might apply equally well to the other. These mandibles differ from those of *Sotalia tucuxi* in that the symphysis is longer and from those of *Delphinodon dividum* in that the posterior margin of the coronoid process above the condyle is more nearly vertical and the number of alveoli is greater. The right mandible has been freed from the matrix, but the left is partially embedded. The mandible is rather long as compared to the skull and the ramus is slightly deeper than that of *Sotalia tucuxi.* The ramus is slenderest at the posterior end of the symphysis and the tooth row occupies about 65 per cent of its total length. The symphysis is longer than in *Sotalia tucuxi*, being almost one-third of the length of the mandible, while in the latter it is less than one-sixth. The rami are firmly ankylosed throughout the symphysis and curve upward to the extremity. On the outer face of the mandible and in position corresponding to the middle of the tooth row are five foramina, from each of which a short canal leads forward. The proximal foramen is placed nearest to the superior margin and the distal foramen nearest to the inferior margin; the first-mentioned foramen opens at the level of the fifteenth tooth, counting forward from the last, and the last-mentioned foramen opens at the level of the posterior end of the symphysis. There is a stitchlike or interrupted stria which commences on the inferior margin in front of the angle and gradually rises on the outer face as it passes forward until

it merges into the groove leading forward from the foramen at the level of the posterior end of the symphysis.

The conformation of the proximal end of the right mandible is similar to that of *Sotalia tucuxi*, except that the angle is prolonged farther backward and the posterior margin of the ramus above the angle is more strongly curved. The coronoid region is not especially elevated, the distance between the apex of the coronoid process and the inferior margin of the angle amounting to less than one-fourth of the total length of the mandible. The superior margin of the mandible slopes from the coronoid process to the middle of the tooth row, while the inferior margin is convex behind the end of the tooth row. The external face of the proximal end of the mandible is convex, except that the superior border of the coronoid process is bent outward as in *Sotalia tucuxi.* Although the right mandible is distorted from crushing, the angle appears to have extended backward nearly to the level of the condyle. The condyle is elliptical in outline, with the long axis oblique.

Back of the tooth row and on the internal surface of the ramus there is the usual orifice for the large dental canal. Beyond this orifice the ramus consists mainly of the thin outer shell, with the addition of shelving strips which merge into the upper and lower borders.

Measurements of the right mandible (in millimeters)

	Cat. No. 8060
Greatest length of right mandible (condyle to tip)	262
Greatest breadth of combined mandibles at extremity	10
Greatest depth of combined mandibles at extremity	10
Greatest depth of right mandible at proximal end of symphysis	15. 8
Greatest depth of right mandible at level of proximal alveolus	31
Greatest length of symphysis	85
Distance from proximal alveolus to distal alveolus	161+
Depth of condyle of right mandible	18

TEETH

With the exception of the distal ones, practically all of the teeth are in position on the left side of the rostrum and on the left mandible. Behind the greatly enlarged anterior tooth at least five teeth are missing near the extremity on the right side of the rostrum and more than half of the teeth are missing on the right mandible. In addition, seven detached teeth have been preserved. The dental formula was originally about $\frac{40—40}{38—38}$.

The teeth (pl. 4) are small, very close together, and have slender crowns, the apices of which are recurved. These teeth are quite unlike those that have been described previously from the Calvert

formation of Maryland. With the possible exception of *Platanista croatica*[12] and *Heterodelphis leiodontus*[13] they do not resemble any of the teeth described from European formations.

These teeth differ from those of *Delphinodon dividum*[14] in so many respects that there is hardly any possibility of confusing them. To emphasize the differences existing between the teeth of these two small dolphins their main characteristics may be summarized as follows: In *Delphinodon dividum* the crowns of the teeth are recurved, with a carina on the anterior and posterior cutting edges, and the enamel is rugose; the posterior teeth have one or more accessory cusps; the roots are slender, elongated, somewhat gibbous below the base of the crown, curved backward at the extremity, and have a large dentinal canal. The largest teeth have a length of 29 mm. and a maximum diameter of 5 mm.; the smallest teeth are 20 mm. long and have a maximum diameter of 4 mm.; the teeth are more or less crowded in the upper and lower jaws. In comparison to those of *Delphinodon dividum* the majority of the teeth of this porpoise are shorter, more slender, and have less swollen roots; the crowns are recurved, but the enamel is relatively smooth; neither accessory cusps nor carinae are present on any of the teeth; one of the largest teeth has a length of 38.3 mm. and a maximum diameter of 3.9 mm.; the smallest teeth are 13 mm. long and have a maximum diameter of 2.8 mm.; the teeth in the upper and lower jaws are separated by intervals slightly less than the maximum diameter of the opposing teeth. The anteriormost tooth on each side is greatly elongated, inserted in the extremity of the premaxilla, and projects forward and slightly downward. The crown of this large tooth measures 11.5 mm. in length and 3.5 mm. in diameter at the base; it tapers gradually and the apex bends downward slightly. The ratio of the enamel crown to the whole tooth varies considerably, being equivalent to less than one-third of the total length on the largest teeth and about one-half on the smallest. Near the anterior end of the series the crowns (pl. 8, figs. 2, 5, 7) are more noticeably compressed in an anteroposterior direction at the base, their apices are more attenuated, and the inward curve is less pronounced than on the posterior teeth. The crowns of the teeth (pl. 8, fig. 3) from near the posterior end of the middle portion of the series are relatively short, robust, and their apices are acute and curve strongly

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[12] Gorjanović-Kramberger, D., De fossilibus Cetaceis Croatiae et Carneoliae. Rad jugoslavenske akademije znanosti i umjetnosti, Zagreb, vol. 111, pl. 1, figs. 5, 5*a*, 6. 1892.

[13] Papp, C. von, Heterodelphis leiodontus nova forma aus den Miocenen Schichten des Comitates Sopron in Ungarn. Mitteil. Jahrbuche Königl. Ungar. Geol. Anstalt, Budapest, vol. 14, Heft 2, text fig. 8, pl. 5, 1905.

[14] True, F. W., Description of a new fossil porpoise of the genus *Delphinodon* from the Miocene formation of Maryland. Journ. Acad. Sci. Philadelphia, ser. 2, vol. 15, pp. 171–174, pl. 19, figs. 1–2; pl. 26. December 9, 1912.

inward. The apex of the crown is most strongly incurved on teeth at the proximal end of the series and less so distally. None of these teeth exhibit any trace of accessory cusps or tubercles. The enamel on the crown is perfectly smooth; the basal margin of the enamel crown is irregularly curved, but no cingulum is developed and the enamel passes into the cementum of the root very gradually, without any perceptible increase or decrease in the diameter of the neck. The penultimate maxillary and mandibular teeth are present on both sides. With the possible exception of the very long teeth (pl 8, fig. 1), the extremities of the roots of all the teeth curve backward. In some instances there is a slight side to side enlargement of the root below the crown. On such teeth both the upper part of the root and the base of the crown are flattened anteriorly and posteriorly. The mandibular teeth are similar to the maxillary in form and size. Unfortunately the anteriormost mandibular teeth are missing from both jaws, but the presence of an additional detached tooth (pl. 8, fig. 1) indicates that the terminal tooth in each mandible was elongated like its mate in the corresponding premaxilla.

Measurements of the teeth (in millimeters)

	Pl. 8, fig. 1	Pl. 8, fig. 2	Pl. 8, fig. 3	Pl. 8, fig. 4	Pl. 8, fig. 5	Pl. 8, fig. 6	Pl. 8, fig. 7
Total length	38. 3+	16. 8	16. 5	15	14	13. 5+	13. 1
Length of crown	11. 5	7. 9	6. 1	6. 4	6. 8	7. 4	6. 3
Greatest diameter of crown at base	3. 5	2. 9	2. 9	2. 9	2. 8	3	2. 7
Greatest diameter of root	3. 9	3. 2	3	3. 2	2. 9	3. 1	2. 8
Least diameter of extremity of root	0. 8	1	0. 9	0. 8	0. 8	x	0. 7

HYOID BONE

Only one of the hyoid bones (pl. 1, fig. 1) is preserved and, judging from its size and other peculiarities, it is the right thyrohyal. This bone is embedded in the matrix behind the left exoccipital and its base is in contact with the transverse process of the atlas. In *Delphinodon dividum*, the lateral winglike thyrohyals are free and are not ankylosed at the base with the basihyal. This may or may not be due to immaturity.

This right thyrohyal is at least 49 mm. long, 8.5 mm. wide at the constriction near the base, and 11.5 mm. wide at the most expanded portion. The extremity is buried in the matrix and the proximal end or base is rugose for cartilaginous attachment to the basihyal. This bone is thickest at the base and tapers to the distal end; the posterior margin is nearly straight, but the anterior is slightly convex. It differs from the thyrohyal of *Delphinodon divi-*

dum in its smaller size and also in the curvature of the anterior and posterior margins, but otherwise the resemblance is rather close.

CERVICAL VERTEBRAE

No ankylosis between individual vertebrae (pl. 14) can be observed in this cervical series, but the centra are crushed against one another. They were not removed from the matrix for study, although direct comparisons were made between them and those of *Delphinodon dividum*, and all of their essential characteristics were determined in this manner. Seven cervical vertebrae comprise this series. The chief peculiarities observable in the cervical series may be enumerated as follows: Atlas of small size, its maximum length being about one-half of its height, with low spine, strong inferior and vestigial bladelike superior transverse processes, and well-developed hyapophysial process; axis with long thick spine, strong inferior transverse processes and small odontoid; neural spines of third to seventh cervicals vestigial; inferior transverse processes of third to fifth cervicals slender, directed obliquely backward, and those of the third are more than twice as long as those of the fifth; inferior transverse processes of sixth cervical relatively large, directed nearly vertically downward; inferior transverse processes of seventh cervical are vestigial; axis and third to seventh cervicals, inclusive, exhibit a longitudinal carina on inferior surface of centrum; foramen at base of superior transverse process on sixth cervical much larger than on any of the preceding; zygapophyses of third to sixth cervicals very similar in size and shape, while those of seventh are much larger; as regards height the centra of the third to seventh cervicals are all about the same; epiphyses of all these vertebrae are very thin.

Atlas.—The atlas differs from that of *Delphinodon dividum* not only in its smaller size, but also in relative height. Another atlas (pl. 12, figs. 3, 4) collected in zone 10 of the Calvert Cliffs has been referred to this species. In general form, as viewed from in front, these two atlases resemble the same vertebra in *Sotalia*. Both of these fossil atlases are relatively long anteroposteriorly, their maximum lengths being about one-half of their height. The upper transverse processes are merely blade-like crests arising along the posterosuperior margin as in *Delphinodon dividum*, but the lower processes are relatively large. On the second atlas (pl. 12, fig. 3) the facets for articulation with the occipital condyles are concave, broader above than below, and are separated inferiorly by a rather wide interval (11.2 mm.). The neural arch is very little elevated and is narrow anteroposteriorly (11.9 mm.) near the spine. It is pierced on each side by a vertebrarterial canal and bears a low blunt spine. The lower transverse processes are short, thickened, and project

obliquely downward and backward. The posterior articular facets (pl. 12, fig. 4) for the axis are subovoidal with convexo-concave surfaces and are set off from the posterior face of the centrum by distinct margins. The hyapophysial process is short, thick, and emarginate. On the upper surface of the hyapophysial process and at the base of the pyriform neural canal there is a large heart-shaped facet for articulation with the odontoid process of the axis.

Axis.—In comparison to the axis of *Delphinodon dividum*, this vertebra is considerably smaller, measuring 57.7 mm. in height and 62.5 mm. between the extremities of the inferior transverse processes, and its greatest thickness anteroposteriorly is more than one-fourth of its breadth, or 16.7 mm. The neural spine is stout, thick at the base, and is inclined backward; the posterior face of the spine is grooved and a low carina is developed on the anterior face. It differs from *D. dividum* in that the neural spine (pl. 5, fig. 1) is proportionately longer; the inferior transverse processes (pl. 14, No. 19) are also longer and are directed more obliquely backward. In *Sotalia* the neural spine of the coossified axis and atlas is excessively enlarged and is directed more backward than upward, projecting above at least four of the succeeding cervicals. The shape of the neural canal and the proportions of the anterior articular facets can not be determined at present. It was possible to determine, however, that the centrum is not as high as in *D. dividum* and the neural canal is relatively shallower. The postzygapophyses have nearly horizontal articular surfaces and are situated nearly as high up as the top of the neural canal. The odontoid process is very similar in shape and proportions to that of *D. dividum*. The transverse processes are directed obliquely backward and outward and are much larger and longer than the corresponding processes of the atlas. They are deep vertically, rather thin anteroposteriorly, and the extremity is obliquely truncated in two directions. There is a longitudinal carina on the interior face of the axis and corresponding depressions on each side.

Third cervical.—The centrum of this cervical is not visible as it has been forced out of its normal position in the series into the neural canal of the axis. The zygapophyses and a portion of the neural arch are all that are exposed on the right side. The position of the remainder was determined by probing. The superior transverse process is slender, with a small elliptical vertebrarterial canal at the base. The inferior transverse process (pl. 14, no. 20) on the left side is slender and more than twice as long as that on the fifth cervical.

Fourth cervical.—The centrum of the fourth cervical (pl. 14, no. 21) is thin, the neural arch is rather broad at the base, and the spine is very low. The inferior processes are slender and are shorter

than those of the third cervical. The superior transverse processes are thin, projecting obliquely downward and outward, and enclosing a small vertebrarterial canal.

Fifth cervical.—As regards thickness, the centra of the fourth and fifth cervicals are about equal. The neural arches are slightly thicker than those of the fourth and are inclined very slightly backward, but the zygapophyses are similar to the preceding. The inferior transverse processes (pl. 14, no. 22) are considerably shorter than those of the fourth and are also thicker. Most of the superior transverse process on the right side is missing, but enough remains to show that the vertebrarterial canal is much larger than any of the preceding.

Sixth cervical.—The centrum is slightly thicker than the preceding. Probably the most characteristic feature of this cervical (pl. 14, no. 23) is the direction of the inferior transverse processes. These processes are similar in proportions to those of *Delphinodon dividum*, but are directed almost straight downward, while in *D. dividum* they are directed as much outward as downward. The distance between the extremities of the inferior transverse processes is 35.5 mm. (outside measurement). The neurapophyses are essentially vertical. The superior transverse processes are bladelike plates which are inclined forward. The neural spine is very short.

Seventh cervical.—In contrast to the preceding cervical, the thin blade-like superior transverse processes are directed forward and the inferior ones are vestigial. The centrum (pl. 14, no. 24) also is slightly thicker than the sixth, and the neurapophyses curve upward and forward. There is an articular facet for the capitulum of the first rib on the posterosuperior angle of the centrum. The greatest anteroposterior diameter (14.1 mm.) of the combined zygapophyses is considerably greater than that of the preceding vertebra (10 mm.). Both epiphyses are missing.

Measurements of the cervical vertebrae (in millimeters)

	Atlas	Axis	3rd	4th	5th	6th	7th
Greatest depth (vertically) of vertebra (tip of neural spine to inferior face of centrum)	37. 6	57. 7	x	33+	33. 2	33	34. 3
Length of centrum	15	16. 7	x	6. 1	6. 2	8	[1] 5
Distance across vertebra between tips of transverse processes (parapophyses)	60	62. 5	x	42+	41+	35. 5	x
Distance between tip of right postzygapophysis and tip of right prezygapophysis	x	x	10	11. 2	10. 2	10	14. 1
Minimum anteroposterior diameter of neurapophysis	x	x	2. 6	2. 8	3	2. 2	x

[1] Both epiphyses missing.

DORSAL VERTEBRAE

It is fortunate that this vertebral column (pl. 1, fig. 1) is intact from the atlas to the fifth lumbar. Because of this fact one can state definitely that the dorsal series consists of not more than 10 vertebrae. With the exception of the extremities of the neural spines and the right transverse processes of the ninth and tenth dorsals, all of these vertebrae are practically complete. The epiphyses of some are loose and a few are missing entirely. The neural arches of all of the dorsal vertebrae are crushed in one direction or another and this must be taken into consideration whenever the measurements given on page 41 are utilized for purposes of comparison. As regards the posterior dorsals, the centra are slenderer and the neural spines relatively wider than those of *Delphinodon dividum*. As compared to those of *Sotalia guianensis*,[15] they differ chiefly in the relative lengths of the centra of the corresponding vertebrae and in the proportions of the neural spines. The posterior dorsal vertebrae of this fossil porpoise differ noticeably from the corresponding vertebrae of many living delphinoids in that the neural spines in proportion to the height of the vertebrae are short and wide, instead of being elongated.

The relation between the length and width of the centrum, the shape of the neural spine, the width of the interval between the prezyapophysial facets, as well as the peculiarities of the diapophysis, including the position of the facet for the tuberculum, will serve as a guide for determining the position of any dorsal in the series. The centra increase in length from the first to the last, the centrum of the tenth dorsal being more than three times as long as the first. The epiphyses of all the dorsals are relatively thin. There is no transitional dorsal with paired facets for articulation with the corresponding rib. Slender neural spines with recurved extremities are the chief peculiarities of the first three dorsals; the neural spines of the remaining dorsals are wider anteroposteriorly and have squarely truncated extremities. There is a progressive decrease in the width of the interval separating the prezygapophysial facets from the anterior to the posterior dorsal. These facets are nearly horizontal on the first seven dorsals, while those of the last three slope obliquely downward and inward. On the first four dorsals the diapophyses are elongated and the facet for articulation with the tuberculum of the rib is situated anterior to the level of the epiphysis, but on the eighth it is entirely behind the level of the epiphysis. The facets for the tubercula increase in length from the first to the eighth dorsals, but decrease in width. On each side of the centrum of the first to the sixth dorsals, inclusive, below the level of the base of the neural

[15] Van Beneden, P. J., and P. Gervais, Ostéographie des Cétacés vivants et fossiles, Paris, Atlas, pl. 41, fig. 1. 1880.

arches and at the posterosuperior angle, there is a well-defined facet for the accommodation of the head of the following rib. Anteriorly the diapophyses arise high up on the neural arch and gradually shift their position to a lower level from the first to the seventh dorsal, but on the eighth the shift is more noticeable since each process arises from the side of the neural arch about midway between the centrum and the top of the neural canal. The postzygapophysial facets become progressively shorter toward the posterior end of the dorsal series and disappear entirely on the first lumbar.

First dorsal.—The anterior dorsal of this porpoise exhibits the structural pecularities which characterize the first dorsals of most living delphinoids. The centrum is nearly three times as wide as long and the usual facet for the capitulum of the second rib is situated at the base of the neural arch on the posterosuperior lateral border of the centrum. The neural spine is especially slender and is curved from base to apex. The neural arch is low, stout, and narrow anteroposteriorly, with a lateral diapophysis on each side which bears a large articular facet for the tuberculum of the first rib. The articular facet which occupies the extremity of this process slopes downward and inward. The neck of the diapophysis is constricted dorsoventrally between the facet and the neural arch. The postzygapophysial facets are large, elongate, and slope obliquely inward. Both epiphyses are missing.

Second dorsal.—Compared with the first dorsal, the centrum is longer, the neural spine is higher, and the articular facet for the tuberculum of the third rib is slightly smaller. The neural spine is slender, but less strongly curved than that of the first dorsal. There is a medium-sized facet for the capitulum of the third rib at the posterior end of the centrum in the usual position. The neural arch is of approximately the same proportions as on the preceding dorsal. The posterior epiphysis is missing and the anterior one is separated from the centrum.

Third dorsal.—The centrum of this dorsal is almost twice as long as that of the first. The neural spine tapers to the extremity and is the least curved of the three anterior dorsals. The diapophyses have shorter necks and the facets for the capitula of the fourth ribs are considerably larger than on the preceding vertebra. The posterior epiphysis is attached to the centrum, but the anterior epiphysis is loose and projects laterally beyond it on the left side.

Fourth dorsal.—The centrum is more than one-half as long as broad. Both epiphyses are attached to the centrum. This vertebra is further characterized by shorter diapophyses and the neural spine is of approximately the same width throughout. Compared with the same vertebra of *Delphinodon dividum* the centrum is propor-

tionately larger and broader, the neural canal is lower, and the diapophyses are shorter.

Fifth dorsal.—In general appearance this vertebra is very similar to the fourth. The centrum (pl. 14, no. 29) is longer than that of the fourth and is more noticeably constricted from side to side near the middle. Both epiphyses are attached to the centrum. The neurapophyses are more highly arched than on the fourth. The metapophyses are broader than on the preceding dorsals and the diapophyses are shorter. The neural spine is similar in outline to that on the fourth dorsal. Compared with the same vertebra of *Delphinodon dividum*, the neural arches and neural spine are relatively wider anteroposteriorly.

Sixth dorsal.—The centrum is almost as long as broad and the neural spine is somewhat wider anteroposteriorly. The centrum is so strongly constricted that an indistinct ventral carina is developed. Both epiphyses are attached to the centrum. The mesial dorsoventral constriction of the diapophyses has disappeared. On the first six dorsals there are distinct facets on the posterosuperior lateral borders of the centra for the capitula of the following ribs, but they are not developed on the seventh and succeeding dorsals. This indicates that there were not more than seven pairs of double headed ribs.

Seventh dorsal.—This vertebra differs very little from the sixth. The centrum (pl. 14, no. 31) is slightly longer than broad, distinctly constricted near the middle, and the tips of the metapophyses are directed upward. The facet on the diapophysis for the tuberculum is subtriangular in outline and the whole process projects at a slightly lower level than on the preceding dorsal. The neural spine is slightly constricted below the extremity. On the first seven dorsals the bases of the neural arches extend practically the full length of the centrum, but on the eighth, ninth, and tenth dorsals they have receded from the posterior epiphysis. Both epiphyses are loose and project laterally beyond the centrum on the left side.

Eighth dorsal.—There is no transitional dorsal with closely approximated facets for the tuberculum and capitulum of the corresponding rib on the side of the neural arch as in *Eurhinodelphis* and many of the living delphinoids. On the eighth dorsal (pl. 14, no. 32) of this fossil porpoise, however, there is a single facet which is placed on the extremity of a short diapophysis. The distance from the inside margin of the neural arch to the tip of the diapophysis is 16.5 mm. The diapophyses project laterally from the neural arches at a considerably lower level than on the seventh dorsal. There is a noticeable increase in the length of the centrum. Both epiphyses are attached to it. The neural spine is wider anteroposteriorly than on the

seventh dorsal, and the same holds true for the neural arches. The anterior margin of the neural spine is more strongly curved than the posterior margin.

Ninth dorsal.—This dorsal (pl. 9, fig. 2) is characterized by a short transverse process (parapophysis) with a wide facet on the extremity for a single-headed rib. The centrum is elongated and constricted from side to side mesially. The anterior epiphysis is loose and projects laterally beyond it on the left side. The metapophyses are large and project obliquely upward.

Tenth dorsal.—The centrum (pl. 9, fig. 3) is longer than broad and the neural arch is slightly wider than on the ninth vertebra. There is a large facet for a single-headed rib on the extremity of the long parapophysis which projects laterally from middle of the centrum. There are some points about the restored right parapophysis which are incorrect. The parapophysis on the left side is complete and the description is based upon this process. The neural spines of the ninth and tenth dorsals are similar in shape and proportions. The metapophyses are large and the postzygapophyses are very much reduced in size. The posterior epiphysis is missing, but the anterior epiphysis is attached to the centrum.

Measurements of the dorsal vertebrae (in millimeters)

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Greatest depth (vertically) of vertebra (tip of neural spine to inferior face of centrum)	52. 3	58	61	61. 2	63. 7	67	67. 2	70	75	73+
Height of anterior face of centrum	x	x	17. 8	18	x	x	19	19. 5	x	x
Breadth centrum posteriorly across facets for tubercula	31	29. 2	29. 5	28. 8	26. 2	x	22. 8	22. 7	x	27. 1
Length of centrum	[2] 8. 9	[2] 11	[1] 15. 8	18. 7	19. 8	[1] 21. 8	23	26. 9	[1] 30. 5	[1] 28. 4
Distance across vertebra between tips of diapophyses	59	x	54	51. 5	x	x	46. 9	51. 7	x	x
Distance across vertebra between tips of transverse processes (parapophyses)	x	x	x	x	x	x	x	x	64	[3] 72
Minimum length of neurapophysis	x	5. 4	6. 5	x	x	x	8	9. 5	x	15
Vertical height of neural spine (distance between superior margin of neural canal and tip of spine)	21+	27+	32+	33+	34+	35+	37+	39+	42+	6 44+
Minimum anteroposterior diameter of the neural spine	7	8. 5	8. 5	10. 5	12. 5	14. 7	13. 7	16. 4	18. 1	18. 5

[1] One epiphysis missing. [2] Both epiphyses missing. [3] Estimated, right parapophysis destroyed.

LUMBAR VERTEBRAE

All of the lumbar vertebrae are incomplete and none retains the transverse process on the right side. Of the anterior lumbars there are three that are more or less complete and two others are represented by the left transverse process; these five lumbar vertebrae represent a consecutive series. All of the intervening lumbars between these and the two that constitute the end of the series are lost. The neural spine and right transverse process are not preserved on the last lumbar and with the exception of the left transverse process all of the second from the last is missing. When complete the lumbar series probably consisted of nine or ten vertebrae. The centra are all longer than broad and progressively increase in length from the anterior one backward. Judging from the centra of the two anterior lumbars and the last lumbar, all of them have a more or less distinct median inferior carina. The transverse processes are as long as the neural spines, very thin, and taper to the distal end which is expanded anteroposteriorly. The transverse processes of the anterior lumbars are inclined forward and those of the posterior ones backward. The neural arches and the neural spines are preserved on the three anterior lumbars. The neural spines are nearly vertical, relatively broad anteroposteriorly, with their expanded extremities rather squarely truncated. The neural arches of the anterior lumbars are vertical, but those of the posterior lumbars are inclined forward. The minimum anteroposterior diameter of the neural arch is slightly less than one-half the length of the centrum, but each neurapophysis is slightly wider at the base. The neural spine is broader anteroposteriorly than the neural arch. The thin lamina-like metapophyses are directed obliquely upward and forward; their superior margins are convex and their inferior margins are angulate. There are no distinct anterior and posterior zygapophyses. The epiphyses of the posterior lumbar are very slightly if at all thicker than either of those on the anterior lumbar.

The lumbars of this fossil porpoise, as compared with those of *Delphinodon dividum*, have more elongated centra, broader neural spines, larger metapophyses, and the transverse processes have expanded extremities in contrast to the slender type of the latter.

First lumbar.—The distal extremity of the neural spine and the major portion of the right transverse process are missing (pl. 9, fig. 4), but only the tip of the right metapophysis is damaged. The centrum is slender, constricted mesially, and exhibits a faint median inferior carina. Both epiphyses are attached to the centrum. The left transverse process is slender, slightly expanded at the extremity, but with the anteroexternal angle obliquely truncated and rounded off. The superior margin of the large metapophysis turns sharply at

the base and forms a distinct angle. The neural arch is not crushed and is not quite as broad as the minimum anteroposterior diameter of the neural spine. In spite of the fact that the neural spine is broken transversely below the middle, at the base, and at the extremity, it is otherwise fairly well preserved.

Second lumbar.—As compared with the first lumbar, the centrum (pl. 9, fig. 5) is slightly longer and wider, the transverse processes are longer, and the neural canal is narrower. All of the right transverse process, the distal extremity of the neural spine, and both epiphyses are missing. The right metapophysis is complete and differs from that on the preceding in that no angle is formed at the base by the superior margin, while the inferior is distinctly angulate. The median inferior carina is more distinct than on the first lumbar. The neural spine is broken transversely near the middle and the extremity is slightly damaged. The left transverse process is more slender, slightly longer, but with the extremity similar to that on the preceding lumbar.

Third lumbar.—The major portion of the centrum (pl. 9, fig. 6), all of the right transverse process, the posterior epiphysis, and the neurapophysis on the right side are missing. The right metapophysis is damaged, but seems to agree with that on the second lumbar. The left transverse process is slightly longer than that on the preceding lumbar and the anteroexternal angle is less obliquely truncated. The neural spine seems to be complete. It is squarely truncated at the extremity and is more noticeably constricted anteroposteriorly than that on the second lumbar.

Fourth lumbar.—Of this lumbar the left transverse process alone remains and it is shorter than on the third, less noticeably constricted anteroposteriorly near the base, more expanded at the extremity, and the anteroexternal angle is less obliquely truncated.

Fifth lumbar.—With the exception of the left transverse process all of this lumbar is missing. This process is slightly shorter than on the fourth lumbar, wider anteroposteriorly at the narrowest part, more expanded distally, and the extremity is truncated nearly at right angles to its main axis.

Ninth lumbar.—The distal portion of the left transverse process is all that remains of this lumbar (pl. 11, fig. 1) and it lacks the anteroexternal angle. It may not be correct as restored.

Tenth lumbar.—Of this lumbar (pl. 10, fig. 1), the neural spine, the neural arches, the anterior epiphysis, and the right transverse process are missing. In comparison to the fifth lumbar, the left transverse process (pl. 11, fig. 2) is somewhat shortened, but the anteroexternal angle is missing. It now appears that the transverse processes are incorrect as restored, because this angle should be less

prominent to correspond with the progressive increase of the posteroexternal angle on the anterior caudals. The centrum is longer and broader than that of the first lumbar and is constricted behind the neural arches. The right transverse process and neural spine have been restored.

Measurements of the lumbar vertebrae (in millimeters)

	1st	2nd	3rd	4th	5th	10th
Greatest depth (vertically) of vertebra (tip of neural spine to inferior face of centrum)	79+	80+	x	x	x	x
Height of anterior face of centrum	21	21	x	x	x	x
Breadth of anterior face of centrum	24. 5	26	x	x	x	31
Height of posterior face of centrum	x	22. 5	x	x	x	26
Breadth of posterior face of centrum	25. 5	30. 2	x	x	x	x
Length of centrum	33. 4	36	x	x	x	[2] 36. 5
Distance from inferior carina on centrum to tip of left transverse process	54	60	[1] 70	x	x	61
Maximum width of extremity of left transverse process	18. 5	20	22. 8	24	27	x
Distance between tip of right postzygapophysis and tip of right prezygapophysis	40+	45	x	x	x	x
Minimum anteroposterior diameter of neurapophysis	16. 5	16. 5	18	x	x	x
Anteroposterior length of neural spine in a horizontal line immediately above the zygapophyses	33. 5	36	35. 5	x	x	x
Vertical height of neural spine (distance between superior margin of neural canal and tip of spine)	48+	47+	51. 5	x	x	x
Minimum anteroposterior diameter of neural spine	19. 5	19	18	x	x	x

[1] Estimated. [2] Anterior epiphysis missing.

CAUDAL VERTEBRAE

The caudal series is likewise incomplete and the position (pl. 1, fig. 1) of those that are preserved shows that they were torn apart before they were completely covered by sediments. Behind the posterior lumbar are the first, second, and third caudals, and the anterior epiphysis of the fourth. Two others which appear to be the sixth and seventh caudals are isolated from the rest. Behind them there appears to be another hiatus, for there are five consecutive vertebrae from near the middle of the series which appear to be the tenth, eleventh, twelfth, thirteenth, and fourteenth caudals. In addition to the above, there is one small terminal caudal.

In enumerating the differences between the caudal series of this fossil porpoise and that of *Sotalia guianensis*, the relative anteroposterior diameters of the neural arches and the position of the dorsal orifice of the lateral vertebrarterial canal should not be overlooked.

The three anterior caudals of this fossil porpoise do not have their transverse processes pierced at the base by a foramen. In *Sotalia* the first and second caudals have transverse processes without perforations and on those near the middle of the series the dorsal orifice of the lateral vertebrarterial canal is nearer to the posterior epiphysis than in *pernix*.

On the anterior caudals the neural canals are narrow and high and they progressively decrease in height up to the fourteenth, beyond which they disappear entirely. The neural arches increase in diameter anteroposteriorly from the first to the fourteenth and on the last-mentioned caudal extend nearly the full length of the centrum. In correlation with the progressive shortening of the neural arches toward the end of the series the metapophyses drop down to a lower level on each succeeding vertebra, those on the first caudal being elevated at least 30 mm. above the top of the centrum, while those on the fourteenth are not more than 3.5 mm. above the centrum. The transverse processes decrease in size from the first to the eleventh and are vestigial on the twelfth. On four of the caudals near the middle of the series (11th to 14th) there are a pair of longitudinal platelike descending processes upon the extremities of which are situated the facets for the chevron bones.

First caudal.—All of this caudal (pl. 11, fig. 3) is well preserved save for the distal portion of the neural spine. The centrum (pl. 10, fig. 2) is approximately equal in length to the last lumbar and is constricted behind the neural arches, with two small articular facets on the ventral surface at the posterior end for the corresponding chevron. The metapophyses are damaged, but their superior margins were originally at least 30 mm. above the top of the centrum. The neural arches are inclined forward, the minimum anteroposterior diameter being less than one-half the length of the centrum. The neural canal is narrow and both neural arches are cracked near the middle. The epiphyses are thin. The transverse processes are short, constricted anteroposteriorly near the base and expanded at their distal extremities. The posteroexternal angles are quite prominent.

Second caudal.—The entire neural spine, both metapophyses, the major portion of the neural arches, the anterior epiphysis, and the extremity of the right transverse process are missing. The centrum (pl. 10, fig. 3) is approximately equal in length to that of the first caudal. The transverse processes (pl. 11, fig. 4) are shorter than those on the preceding caudal, more expanded anteroposteriorly at the extremity, and the posteroexternal angle is prolonged backward. The paired facets for the chevron on the inferior surface of the centrum at the posterior end are relatively large. The neural canal is not more than 13 mm. in height posteriorly.

Third caudal.—It (pl. 10, fig. 4) is complete with the exception of the distal end of the neural spine and the extremities of the metapophyses. The centrum is similar in proportions to the first and second lumbars, but is shorter. The neural canal is not over 10 mm. in height posteriorly. The posterior margin of the neural spine does not quite overhang the base of the neural arch. The minimum anteroposterior diameter (17.9 mm.) of the left transverse process is about two-thirds the diameter (29.8 mm.) at the extremity. The posteroexternal angles of the transverse processes (pl. 11, fig. 5) are very prominent. The tip of the left and most of the right metapophyses are destroyed; their superior margins were not over 28 mm. above the top of the centrum.

Fourth caudal.—Of this caudal (pl. 10, fig. 5) the anterior epiphysis alone is preserved. The major portion of this ephiphysis is hidden by the matrix. It measures 3.4 mm. in thickness. Most of the ridges for attachment to the centrum radiate from the center.

Sixth caudal.—With the exception of the anterior epiphysis, all parts of this vertebra (pl. 12, fig. 1) are present. Judging from the length of the centrum and other peculiarities, this seems to be the sixth in the series. The posterior facets for the chevrons are placed obliquely on the posterior faces of the large descending processes, while the anterior facets are narrower and barely discernible. The left transverse process is strongly constricted at the base, measuring 16.8 mm. in width, the extremity is expanded, and the distance between the canal at the base and the anteroexternal angle is 28.4 mm. The metapophyses are large processes which have a lateral carina and they project forward beyond the level of the anterior epiphysis; their superior margins are at least 25.5 mm. above the top of the centrum. The neural arches are relatively broad in comparison to the length of the centrum and are inclined forward. The neural spine is wider than the neural arch, short in proportion to the size of the centrum, but longer than the transverse process, and with the extremity squarely truncated. The neural arches are complete and the neural canal measures 9.5 mm. in height posteriorly.

Seventh caudal.—The centrum (pl. 12, fig. 2) is shorter than that of the preceding caudal and the posterior facets for the chevrons are borne on longer and narrower descending processes; the anterior facets are more carinate, the transverse processes are shorter, the neural spine is considerably shorter and more noticeably constricted near the base. The anteroposterior diameter (15.5 mm.) of the left transverse process at the narrowest point is about one-fifth less than at the extremity (19.8 mm.); the distance from the canal at the base to the anteroexternal angle is 21 mm. The neural arches are complete, with a minimum anteroposterior diameter of 16.5 mm., and the height of the neural canal posteriorly is 8 mm. The minimum

anteroposterior diameter of the neural spine near the base (16.7 mm.) is more than half the maximum diameter (28.4 mm.) at the extremity. The metapophyses are knoblike processes which project beyond the anterior epiphysis; they are carinate externally and their dorsal margins are at least 20 mm. above the top of the centrum.

Tenth caudal.—The neural spine (pl. 1, fig. 1) is broken above the level of the metapophyses and its extremity is missing. A large portion of this caudal is still hidden by the matrix. The height of the neural canal posteriorly is 6 mm. The enlargement on the posterior border of the neural spine about halfway between the extremity and the level of the metapophyses is the most unusual peculiarity. The minimum anteroposterior diameter of the neurapophysis is approximately the same as the minimum diameter of the neural spine. The inferior descending processes on which the posterior facets for the chevron are borne are thicker than those on the seventh caudal, but unlike those on the eleventh are not joined with the processes of the anterior facets by a continuous lamina of bone. The transverse processes are short, subtriangular in outline, and the distance from the foramen at the base to the anteroexternal angle is 16 mm.

Eleventh caudal.—The neural spine (pl. 13, fig. 1) is fractured at the base, but otherwise this caudal is practically complete. It is characterized by very short triangular transverse processes, a small neural canal, a short neural spine, and small metapophyses. The minimum anteroposterior diameter of the neurapophysis (19.5 mm.) is considerably greater than the minimum diameter of the neural spine (13.8 mm.). The height of the neural canal posteriorly is 4.5 mm. The paired descending processes on which are situated the posterior facets for the corresponding chevron are continuous anteriorly with those for the preceding chevron. The thin lamina of bone which connects these processes is perforated mesially by an elongate foramen. The distance from the foramen at the base of the transverse process to the anteroexternal angle is 13.5 mm. The lateral surface of the centrum is traversed obliquely by a broad groove which extends from the posterior margin of the neural arch to the above-mentioned foramen.

Twelfth caudal.—This caudal (pl. 13, fig. 2) is complete. The centrum is rather deep but is narrow transversely. The paired descending processes on which are situated the posterior facets for the corresponding chevron are swollen, occupying more than half the length of the centrum, continuous anteriorly with those for the preceding chevron, and are pierced mesially by a foramen of medium size. From this foramen a short broad groove extends upward to the inferior orifice of the lateral vertebrarterial canal. About 7.5

mm. in front of the posterior margin of the neural arch is a small foramen which leads from the neural canal and opens into a broad groove which extends downward across the lateral face of the centrum to the superior orifice of the lateral vertebrarterial canal at the base of the vestigial transverse process. The metapophyses project forward beyond the anterior epiphysis. The minimum anteroposterior diameter of the neural spine (13.7 mm.) is slightly more than one-half of the minimum diameter of the neural arch (21 mm.). The height of the neural canal posteriorly is 3.5 mm.

Thirteenth caudal.—It (pl. 13, fig. 3) is characterized by a very small neural spine, which is longer than high, small but distinct metapophyses, and a pair of thick platelike descending processes which extend the length of the inferior face of the centrum, with facets for chevrons at both ends. Each of these descending processes is pierced mesially by a small foramen which opens on the lateral face of the centrum into a short deep groove, that in turn leads to the lateral vertebrarterial canal. Above the dorsal orifice of this vertebrarterial canal is a short groove which, however, does not extend upward as far as the posterior margin of the neural arch. The distance between the dorsal and ventral orifices of the lateral vertebrarterial canal is 9 mm. The neural canal is very small. The centrum is pierced dorsoventrally near the middle by a pair of minute canals. The anterior epiphysis is missing.

Fourteenth caudal.—The posterior epiphysis (pl. 13, fig. 4) and the neural spine are missing, but otherwise the vertebra is complete. The centrum is as deep as long. Thick platelike descending processes bearing facets at the anterior and the posterior ends for chevrons extend the full length of the inferior surface of the centrum. They are separated mesially by the usual longitudinal excavation and are pierced behind the middle by a small foramen. The distance between the dorsal and ventral orifices of the vertebrarterial canal is 12.3 mm. This caudal apparently had a small neural spine, but it has been destroyed. The small neural canal is open, but the metapophyses are vestigial.

Terminal caudal.—This caudal measures 16.7 mm. in width, 6+mm. in thickness, and 9.5 mm. in depth. One face of the centrum was destroyed by the pick of the collector. The centrum is pierced dorsoventrally by a pair of large canals, the dorsal orifices of which are at least 5.8 mm. apart; the dorsal and ventral surfaces are convex from side to side. The side which appears to be the anterior face is convex. A pair of blunt processes are developed on each side at the dorsal and ventral angles by the mesial side to side constriction of the centrum, and in direction they are oblique to the transverse axis of the centrum.

Measurements of the caudal vertebrae (in millimeters)

	1st	2nd	3rd	6th	7th	10th	11th	12th	13th	14th
Greatest depth (vertically) of vertebra (tip of neural spine to inferior face of centrum)	x	x	x	68. 4	75. 3	[1]77+	56. 6	49. 3	42. 2	31
Greatest height of centrum anteriorly	x	x	x	27	26. 8	x	28. 3	28. 2	30. 3	28
Breadth of anterior face of centrum	27. 2	31. 5	32. 7	x	30	x	x	x	x	24. 4
Greatest height of centrum posteriorly	29. 5	32. 3	x	32. 4	32. 5	31. 8	32. 8	32. 7	30. 5	28. 2
Breadth of posterior face of centrum	30. 2	31. 5	31+	31. 2	x	33. 5	27. 5	26	23. 8	22. 5
Length of centrum	39. 5	[2]37. 5	37. 3	[2]33. 8	33. 8	29. 5	29	28	27. 8	[3]24. 5
Distance from base of neural arch (inside margin) to tip of left transverse process	55	51	45	40	34	27. 5	24	21	x	x
Maximum width of extremity of left transverse process	26. 4	28. 9	29. 8	20. 5	19. 8	x	x	x	x	x
Minimum anteroposterior diameter of neurapophysis	16. 7	x	16. 9	16. 7	16. 5	17. 7	19. 5	21	19. 5	15. 5
Vertical height of neural spine (distance between superior margin of spinal canal and tip of spine)	x	x	x	44	36	42±	23. 8	16. 5	12	x

[1] Estimated. [2] Anterior epiphysis missing. [3] Posterior epiphysis missing.

CHEVRON BONES

Four chevron bones are preserved with the skeleton. One of them (pl. 13, fig. 5) belongs with an anterior caudal. It is the largest one of the four and has a wide blade, the anteroposterior diameter at the extremity being equivalent to about two-thirds of the depth of the chevron. Another chevron (pl. 10, fig. 6, and pl. 11, fig. 7) which belongs with some following caudal has a much broader blade, the anteroposterior diameter at the extremity being greater than the depth of the chevron. The inferior margin of the blade of this chevron is curved, while that of the preceding chevron is almost straight. The third chevron (pl. 11, fig. 6) belongs farther back and is smaller, but the anteroposterior diameter of the extremity of the blade is almost equivalent to the depth of the chevron; the inferior free margin of the blade is slightly curved. The smallest (pl. 11, fig. 8) of all these chevrons is probably the last in the series and may have belonged with the fourteenth caudal. The blade is very short and the anteroposterior diameter at the extremity is more than twice the depth of the chevron.

Measurements of the chevron bones (in millimeters)

	Chevron No. 1, pl. 13, fig. 5	Chevron No. 2, pl. 11, fig. 7	Chevron No. 3, pl. 11, fig. 6	Chevron No. 4, pl. 11, fig. 8
Depth of chevron	25. 4	20. 6	19	7. 7
Antero-posterior diameter of blade at extremity	16. 4	21	18. 7	16. 2
Antero-posterior diameter of articular facet on base of chevron (right side)	13	13. 8	10. 2	11
Distance between internal margins of articular facets on base of chevron	5	7. 6	9. 8	5

SCAPULA

The anterior half of the left scapula (pl. 1, fig. 1) is missing, but the posterior half is complete. The internal face is exposed and the external is hidden in the matrix. Aside from its smaller size, it resembles the corresponding portion of the scapula of *Delphinodon dividum*, but the posterior margin is not as deeply concave. The vertebral border is evenly convex. Scarcely any trace of ridges can be observed on the internal face of the blade, but there is a shallow depression in the mesial region which corresponds in a general way to the insertion of the subscapularis muscle. Between this depression and the posterior angle the internal surface of the scapula is flat; the serratus anticus muscle is inserted in this region in living porpoises.

Measurements of the left scapula (in millimeters)

Exterointernal diameter of head	16
Posterior margin of head to posterior angle of blade	78
Inferior margin of head of vertebral margin of blade	86

HUMERUS

With the exception of a portion of the epiphysis from the proximal end, all of the right humerus is missing. In size, this humerus is smaller than any of those hitherto obtained from the Calvert formation. The lesser tuberosity is considerably larger than the greater tuberosity, an anomalous condition which prevails in many of the living porpoises. On the outer half of the proximal face of the lesser tuberosity there is a well-defined ovoidal concavity which corresponds in position to the usual place for the attachment of the subdeltoid muscle. The bicipital groove is deep. The external face of the greater tuberosity is very rugose and in this area was attached a part of the deltoid muscle. Most of the head is missing.

Measurements of the right humerus (in millimeters)

Greatest exterointernal diameter of lesser tuberosity	18.5
Greatest anteroposterior diameter of lesser tuberosity	11.2
Greatest exterointernal diameter of epiphysis across lesser tuberosity	22.8

RIBS

Very few of the ribs are complete, and most of them are fractured in one or more places. The ribs were not disturbed when the slab in which they were embedded was prepared for exhibition and the whole or portions of 20 ribs are shown (pl. 14) in their original positions. Eight of those on the left side are associated with the corresponding dorsal vertebra. Those on the right side of the vertebral column lie in a more or less tangled pile.

Of the ten pairs of ribs the first were the shortest. Judging from those that are fairly complete, the ribs rapidly increase in length from the first (92–94 mm.) to the fifth (207+mm.) and then decrease in length to the tenth (147+mm.). The distal extremities of the first five pairs of ribs are expanded to provide for the attachment of cartilaginous sternal ribs. The capitula of the first to seventh ribs are borne upon long necks, the seventh rib having the longest neck and the first the thickest neck. On the first to fifth ribs, inclusive, the capitula are ovoidal in outline. The eighth, ninth, and tenth ribs are single headed. The first seven ribs have capitula which articulate with definite facets on the posterosuperior angle of the centra as well as tubercula which articulate with facets on the extremities of the diapophyses. On the eighth rib the articulation is with the diapophysis alone, and on the ninth and tenth with the parapophysis (transverse process).

The first rib (pl. 14, figs. 1, 10) is short, flattened, greatly expanded between the angle and the tuberculum; the capitulum is borne upon a short, thick neck. The tuberculum is larger than the capitulum. The shaft is nearly straight below the angle. The first rib is about three-fifths as long as the second, but the shaft of the latter (pl. 14, figs. 2, 11) is much less expanded between the angle and the tuberculum, and the neck is longer. The right rib of the third pair (pl. 14, figs. 3, 12) is more nearly complete than the left. This rib is characterized by a longer and more strongly curved shaft and the neck is thicker than the second rib. The expanded distal extremity is rather wide. Less than half of the right rib of the fourth pair (pl. 14, figs. 4, 13) is preserved and the one on the left side is broken in at least two places. The fourth and fifth ribs are very similar in most respects, but the latter (pl. 14, figs. 5, 14) is the longest. The necks of these two ribs are slender

and curve upward to the extremity; the tubercula are ovoidal in outline and are broadest at the posterior end. A considerable portion of the sixth rib (pl. 14, figs. 6, 15) on the right side is missing and the one on the left side is for the most part concealed by matrix. The shaft of the sixth rib is more slender than any of the preceding, the capitulum is smaller and more nearly circular, and the tuberculum is pyriform in outline. The shaft of the seventh rib (pl. 14, figs. 7, 16) is much narrower than any of the preceding, resembling the eighth in this respect; the extremity is thin, but there is a distinct surface for the attachment of a cartilaginous sternal rib. The eighth, ninth, and tenth ribs have a single facet at the proximal end and slender shafts which are slightly bowed. All of these posterior ribs are rather thin at the distal end, with one face flattened and the other more or less convex. The eighth rib (pl. 14, fig. 8) has a more elongate capitulum than either of the following ribs.

Measurements of the ribs (in millimeters)

	First rib		Second rib		Third rib		Fourth rib		Fifth rib	
	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right
Greatest length in a straight line	93. 9	92	150	152	145+	126+	197±	93+	207±	121+
Greatest breadth of shaft at angle	18. 5	17. 8	9. 6	10	9. 2	x	9	x	8. 2	7. 9
Distance between external margin of tuberculum and anterior margin of capitulum	25. 8	25. 8	22. 5	x	x	x	22. 7	x	22. 2	x
Greatest thickness of shaft near the middle	3. 8	x	3. 9	4	x	4. 6	x	4	4	4. 7
Greatest diameter of articular facet on head of rib	6. 1	6. 5	6. 5	x	6. 9	6. 7	7. 8	x	5. 5	x
Greatest diameter of articular facet on tubercle of rib	10. 1	10	x	9. 5	x	x	11	x	10. 2	x
Least breadth of neck	7	6. 7+	6. 9	x	6. 8	5. 2	7. 5	x	5. 9	x

Measurements of the ribs (in millimeters)—Continued

	Sixth rib		Seventh rib		Eighth rib		Ninth rib		Tenth rib	
	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right
Greatest length in a straight line	x	x	201+	x	192+	x	183. 5	x	147+	x
Greatest breadth of shaft at angle	7. 5	7. 2	6. 5	x	6	x	x	x	x	x
Distance between external margin of tuberculum and anterior margin of capitulum	20. 5	x	26	26. 5	x	x	x	x	x	x
Greatest thickness of shaft near the middle	x	x	x	5	4. 4	x	4	x	3. 8	x
Greatest diameter of articular facet on head of rib	5. 8	x	5. 8	x	10. 7	x	7. 8	x	x	x
Greatest diameter of articular facet on tubercle of rib	8. 5	x	11. 8	12	x	x	x	x	x	x
Least breadth of neck	4. 8	x	4. 9	x	x	x	x	x	x	x

EXPLANATION OF PLATES

Kentriodon pernix. Cat. No. 8060, Division of Vertebrate Palaeontology, United States National Museum. Calvert formation, western shore of Chesapeake Bay, about one and one-half miles south of Chesapeake Beach, Calvert County, Maryland. Collected by Norman H. Boss, July 5–7, 1913. Cat. No. 10670, Division of Vertebrate Palaeontology, United States National Museum. Calvert formation, western shore of Chesapeake Bay, south of Chesapeake Beach, Calvert County, Maryland. Collected by William Palmer, July, 1918.

The following abbreviations are used on plates 3 to 7. *Al.*, alisphenoid; *Ant. n.*, antorbital notch; *Ap. max.*, apophysis of maxilla; *Bo.*, basioccipital; *Bs.*, basisphenoid; *C.*, condyle; *Cr. l.*, lambdoid crest; *Ex. oc.*, exoccipital; *Fal. pr.*, falcate process of basioccipital; *Fo. h.*, hypoglossal foramen; *Fo. inf.*, infraorbital foramen; *Fo. m.*, foramen magnum; *Fo. max.*, maxillary foramen; *Fo. pmx.*, premaxillary foramen; *Fr.*, frontal; *J. inc.*, jugular incisure; *Ju.*, jugal; *La.*, lachrymal; *Max.*, maxilla; *Na.*, nasal; *N. A.*, respiratory passage; *Pa.*, parietal; *Pmx.*, premaxilla; *Poc. pr.*, paroccipital process of exoccipital; *Pt.*, pterygoid; *S. oc.*, supraoccipital; *S. or. pr.*, supraorbital process of frontal; *Sq.*, squamosal; *Vo.*, vomer; *Zyg.*, zygomatic process of squamosal; *1*, passage for mandibular branch of trigeminal nerve in a cleft on posterior border of alisphenoid; *2*, foramen lacerum posterius.

PLATE 1

Fig. 1, Skeleton of *Kentriodon pernix.* Matrix has been removed to show the position of the various elements. Cat. No. 8060, U.S.N.M. About one-seventh natural size. Left tympanic bulla, about natural size. Fig. 2, Ventral view; Fig. 3, External view; Fig. 4, Internal view; Fig. 5, Dorsal view.

PLATE 2

Dorsal view of skull of *Kentriodon pernix*. Cat. No. 8060, U.S.N.M. About three-fifths natural size. Allowance must be made for distortion, because this is a photograph of the image of the dorsal surface in the mirror back of the skull on the skeleton now on exhibition.

PLATE 3

Fig. 1, Posterior view of skull of *Kentriodon pernix*. Cat. No. 10670, U.S.N.M. About eight-elevenths natural size. Left periotic, about seven-thirds natural size. Fig. 2, Tympanic or ventral view; Fig. 3, External view; Fig. 4, Cerebral or internal view.

PLATE 4

Ventral view of skull and cervical vertebrae of *Kentriodon pernix*. Cat. No. 8060, U.S.N.M. About one-half natural size.

PLATE 5

Lateral views of skulls of *Kentriodon pernix*. About eleven-twentieths natural size. Fig. 1, Skull, Cat. No. 8060, U.S.N.M.; Fig. 2, Skull, Cat. No. 10670, U.S.N.M.

PLATE 6

Dorsal view of skull of *Kentriodon pernix*. Cat. No. 10670, U.S.N.M. About eleven-twentieths natural size.

PLATE 7

Ventral view of skull of *Kentriodon pernix*. Cat. No. 10670, U.S.N.M. About eleven-twentieths natural size.

PLATE 8

Views of seven teeth of *Kentriodon pernix*. Cat. No. 8060, U.S.N.M. About three times natural size. Fig. 1, Anteriormost tooth in mandible; Fig. 2, Tooth from anterior end of middle portion of tooth row; Fig. 3, Tooth from posterior end of middle portion of tooth row; Figs. 4–7, Teeth from near anterior end of tooth row.

PLATE 9

Lateral views of posterior dorsals and anterior lumbars of *Kentriodon pernix*. Cat. No. 8060, U.S.N.M. About natural size. Fig. 1, Eighth dorsal, partially concealed by shafts of fifth and eighth ribs; Fig. 2, Ninth dorsal, partially concealed by shafts of fifth, eighth, and ninth ribs, and with extremity of neural spine restored; Fig. 3, Tenth dorsal, partially concealed by extremity of ninth rib, and with right transverse process and extremity of neural spine restored; Fig. 4, First lumbar, with extremity of neural spine and right transverse process restored; Fig. 5, Second lumbar, with extremity of neural spine and right transverse process restored; Fig. 6, Third lumbar, with centrum, right neurapophysis, and right transverse process restored.

PLATE 10

Lateral views of posterior lumbar, anterior caudals, and chevron of *Kentriodon pernix.* Cat. No. 8060, U.S.N.M. About natural size. Fig. 1, Last lumbar, with right transverse process, neural arches, and neural spine restored; Fig. 2, First caudal, with extremity of neural spine restored; Fig. 3, Second caudal, with neural arches and neural spine restored; Fig. 4, Third caudal, no restoration; Fig. 5, Anterior epiphysis of Fourth caudal; Fig. 6, Chevron of an anterior caudal.

PLATE 11

Dorsal views of posterior lumbars and anterior caudals of *Kentriodon pernix.* Cat. No. 8060, U.S.N.M. About three-fourths natural size. Fig. 1, Left transverse process of next to last lumbar, with anteroexternal angle restored; Fig. 2, Last lumbar, with right transverse process, neural arches, neural spine, and anteroexternal angle of left transverse process, restored; Fig. 3, First caudal, with extremity of neural spine restored; Fig. 4, Second caudal, with extremity of right transverse process, neural arches, and neural spine restored; Fig. 5, Third caudal, no restoration; Fig. 6, Lateral view of chevron of an anterior caudal; Fig. 7, Dorsal view of chevron of an anterior caudal; Fig. 8, Dorsal view of chevron of a posterior caudal; Fig. 9, Anterior epiphysis of fourth caudal.

PLATE 12

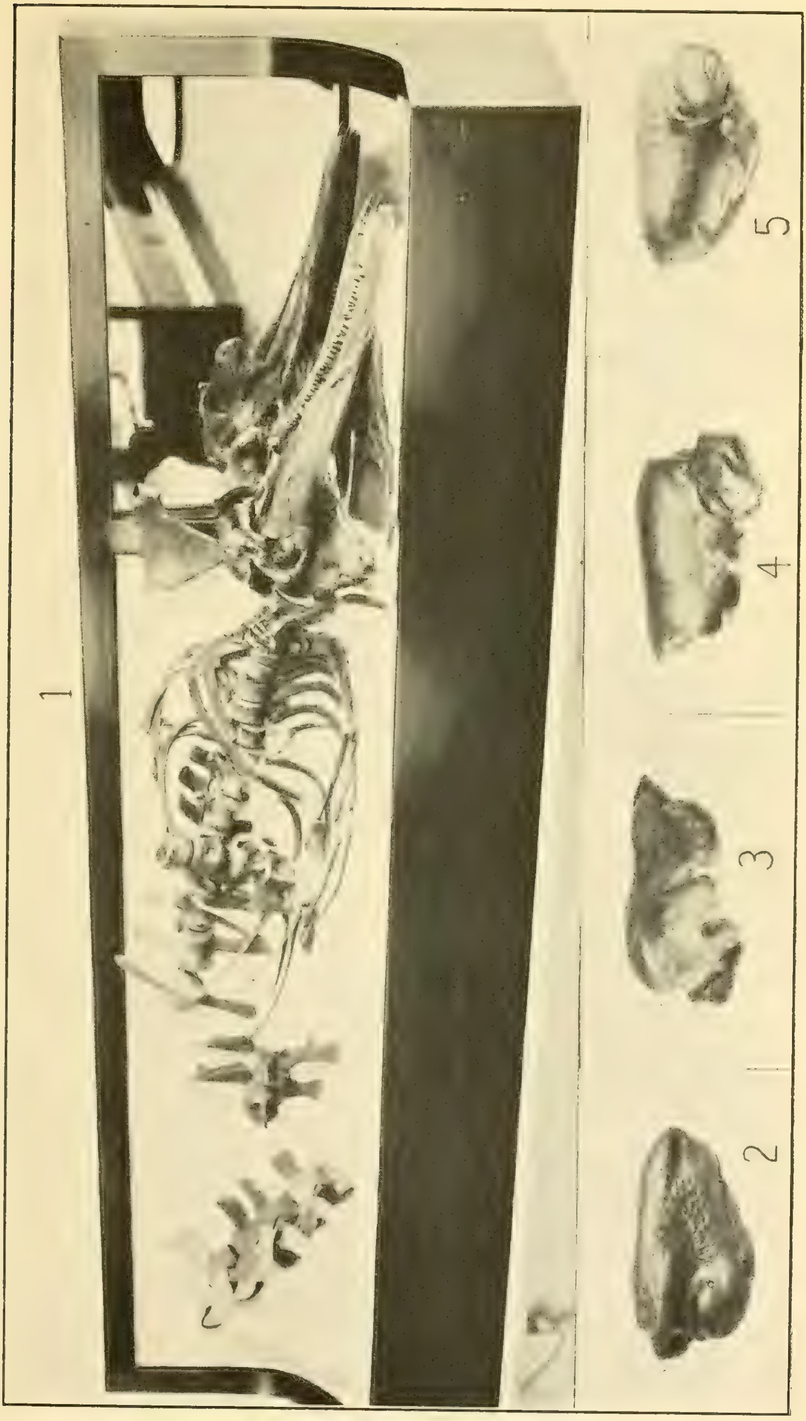
Lateral views of caudal vertebrae of *Kentriodon pernix.* Cat. No. 8060, U.S.N.M. About natural size. No restoration. Fig. 1, Sixth caudal; Fig. 2, Seventh caudal. Atlas of *Kentriodon pernix.* Cat. No. 11400, U.S.N.M. About nine-elevenths natural size. Fig. 3, Anterior view of atlas; Fig. 4, Posterior view of atlas.

PLATE 13

Lateral views of caudal vertebrae and an anterior chevron of *Kentriodon pernix.* Cat. No. 8060, U.S.N.M. About natural size. No restoration. Fig. 1, Eleventh caudal; Fig. 2, Twelfth caudal; Fig. 3, Thirteenth caudal; Fig. 4, Fourteenth caudal; Fig. 5, Chevron of an anterior caudal.

PLATE 14

Ventral view of vertebral column of *Kentriodon pernix* with associated ribs. Cat. No. 8060, U.S.N.M. About one-half natural size. No restoration. 1, First rib, left; 2, Second rib, left; 3, Third rib, left; 4, Fourth rib, left; 5, Fifth rib, left; 6, Sixth rib, left; 7, Seventh rib, left; 8, Eighth rib, left; 9, Ninth rib, left; 10, First rib, right; 11, Second rib, right; 12, Third rib, right; 13, Fourth rib, right; 14, Fifth rib, right; 15, Sixth rib, right; 16, Seventh rib, right; 17, Eighth rib, right; 18, Atlas; 19, Axis; 20, Left parapophysis, third cervical; 21, Fourth cervical; 22, Fifth cervical; 23, Sixth cervical; 24, Seventh cervical; 25, First dorsal; 26, Second dorsal; 27, Third dorsal; 28, Fourth dorsal; 29, Fifth dorsal; 30, Sixth dorsal; 31, Seventh dorsal; 32, Eighth dorsal; 33, Tenth caudal; 34, Eleventh caudal; 35, Twelfth caudal; 36, Thirteenth caudal; 37, Fourteenth caudal; 38, Chevron of an anterior caudal.



SKELETON AND TYMPANIC BONE OF KENTRIODON PERNIX

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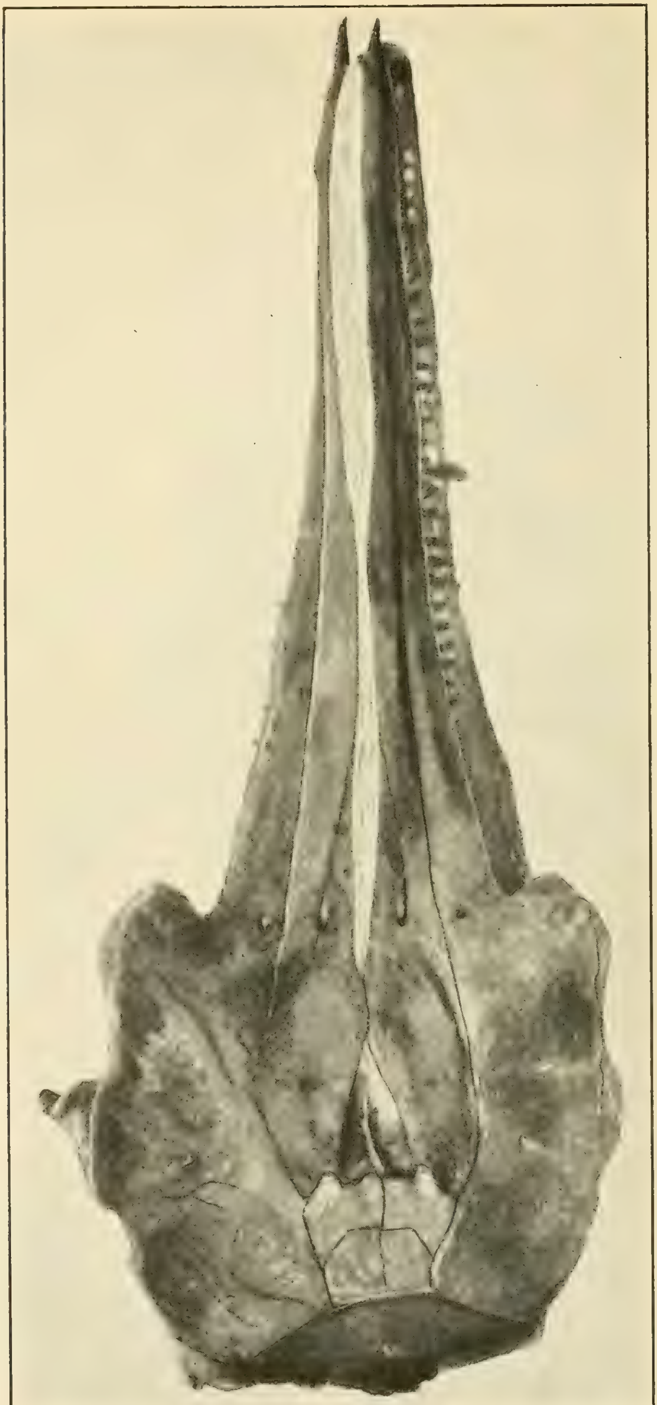

DORSAL VIEW OF SKULL OF KENTRIODON PERNIX

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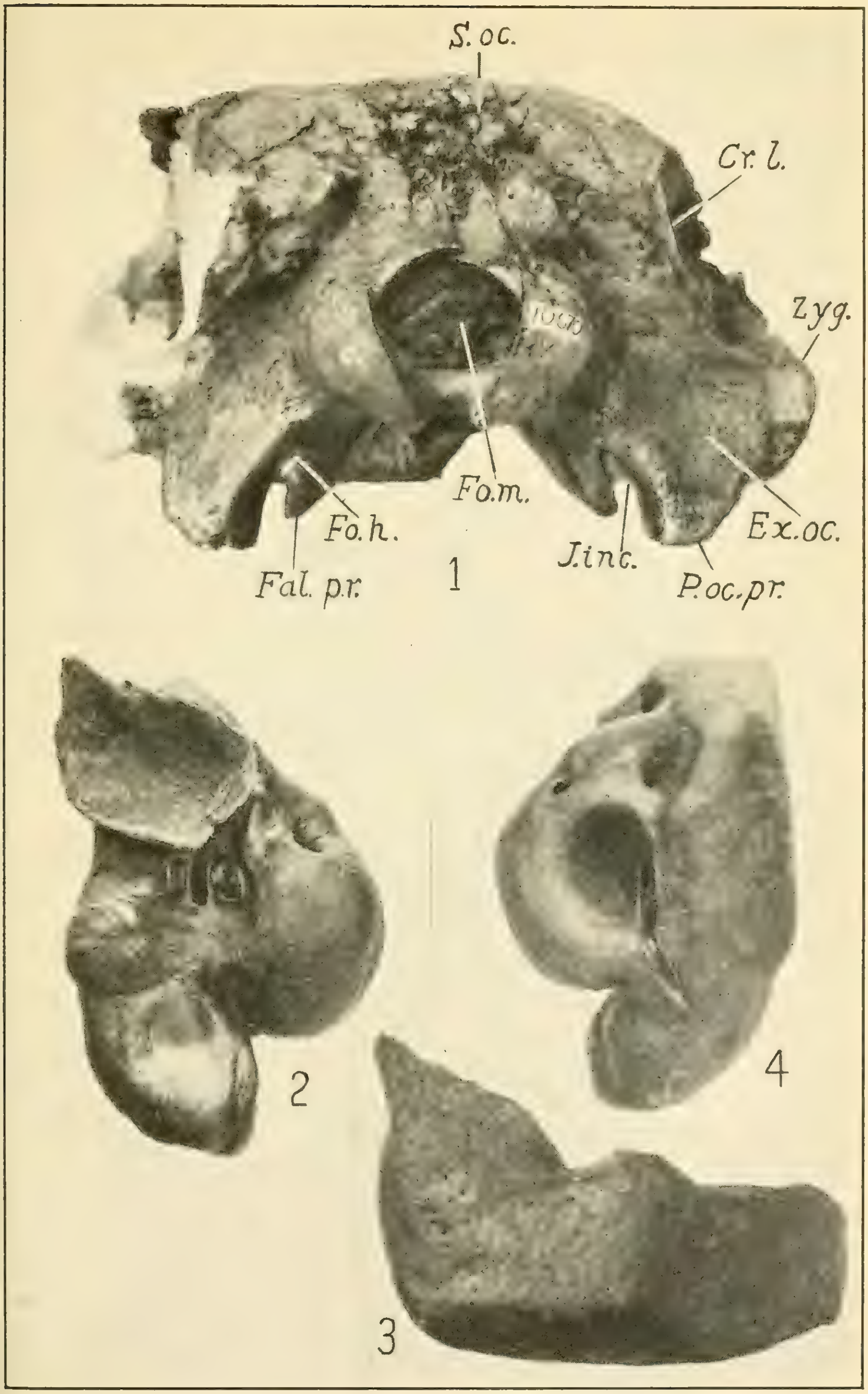

POSTERIOR VIEW OF SKULL AND VIEWS OF PERIOTIC OF KENTRIODON PERNIX

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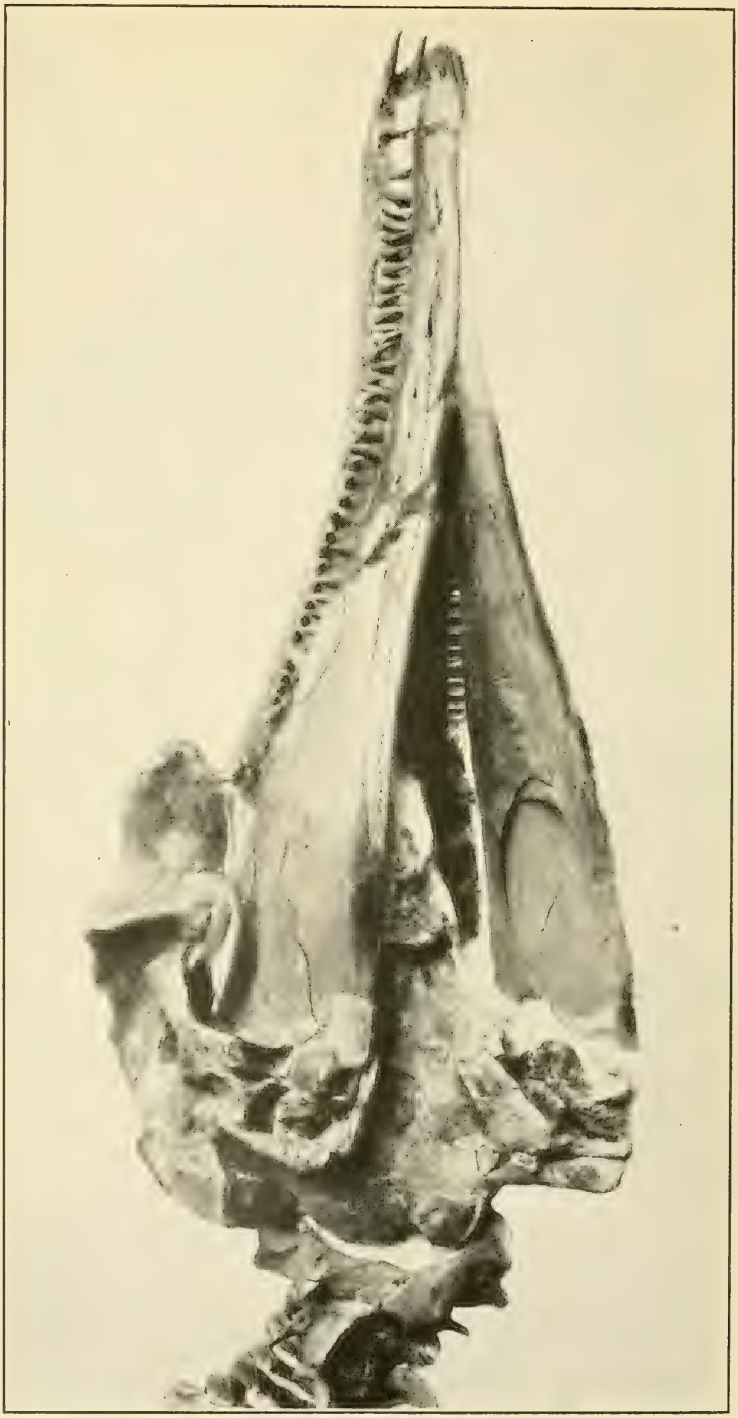

VENTRAL VIEW OF SKULL AND MANDIBLES OF KENTRIODON PERNIX

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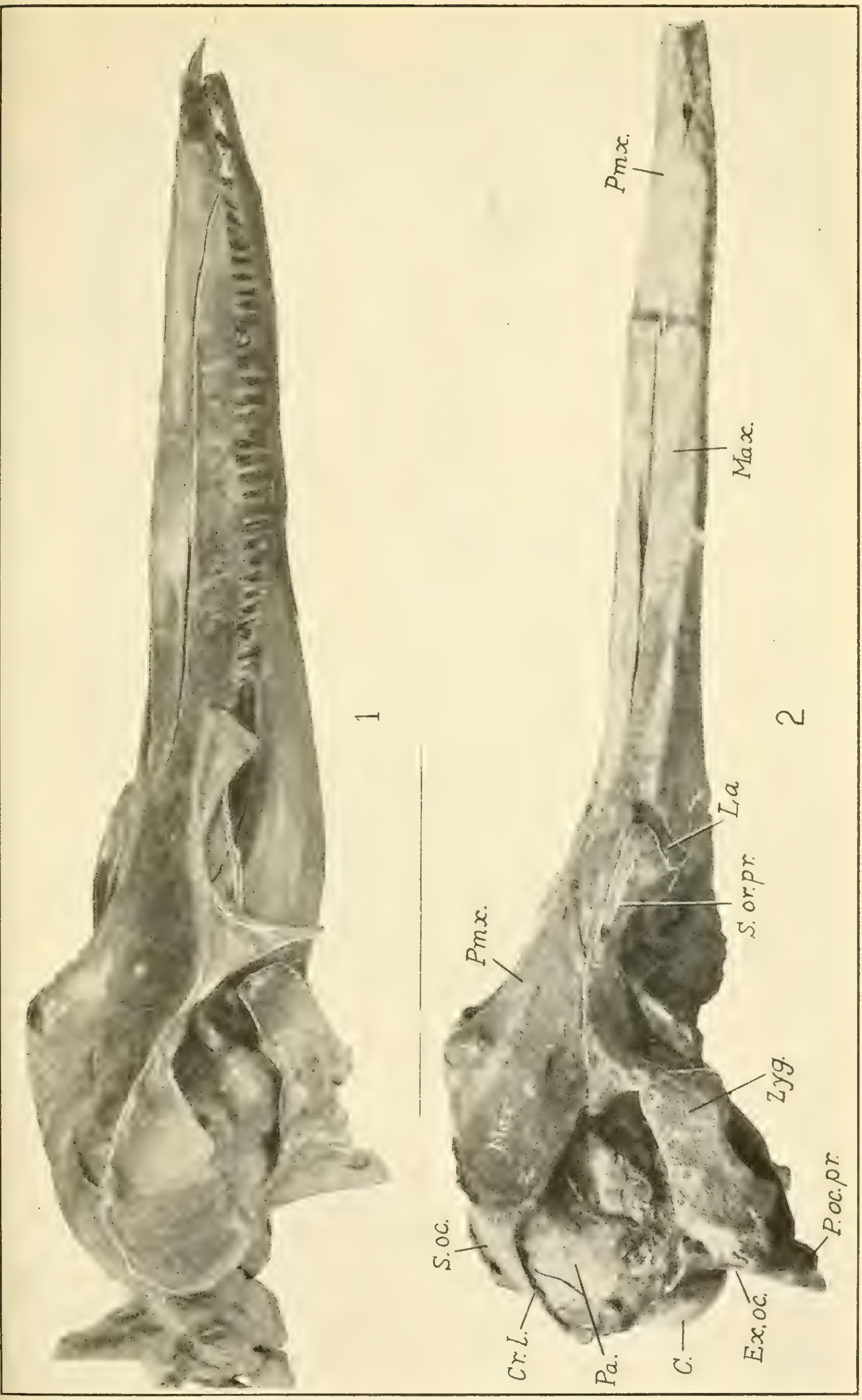

LATERAL VIEWS OF SKULLS OF KENTRIODON PERNIX

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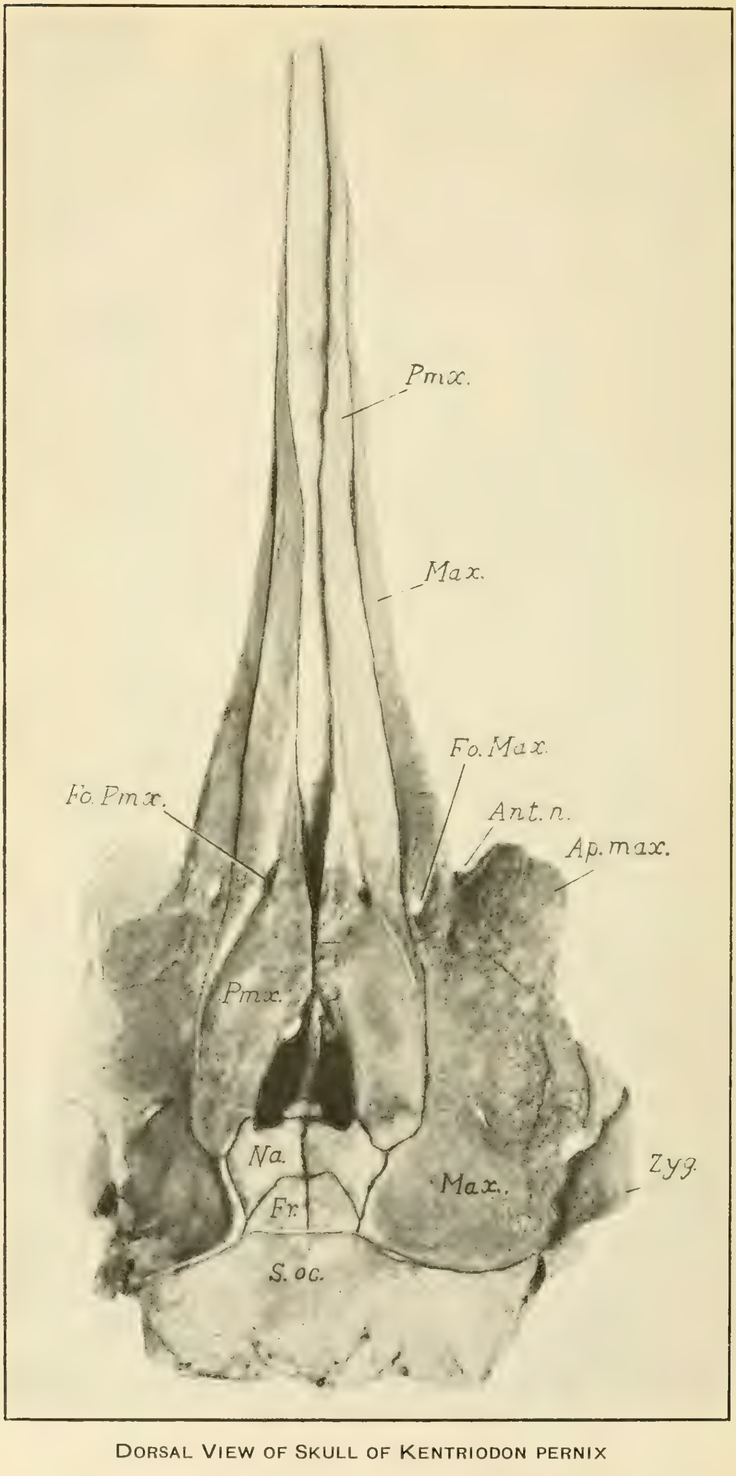

DORSAL VIEW OF SKULL OF KENTRIODON PERNIX

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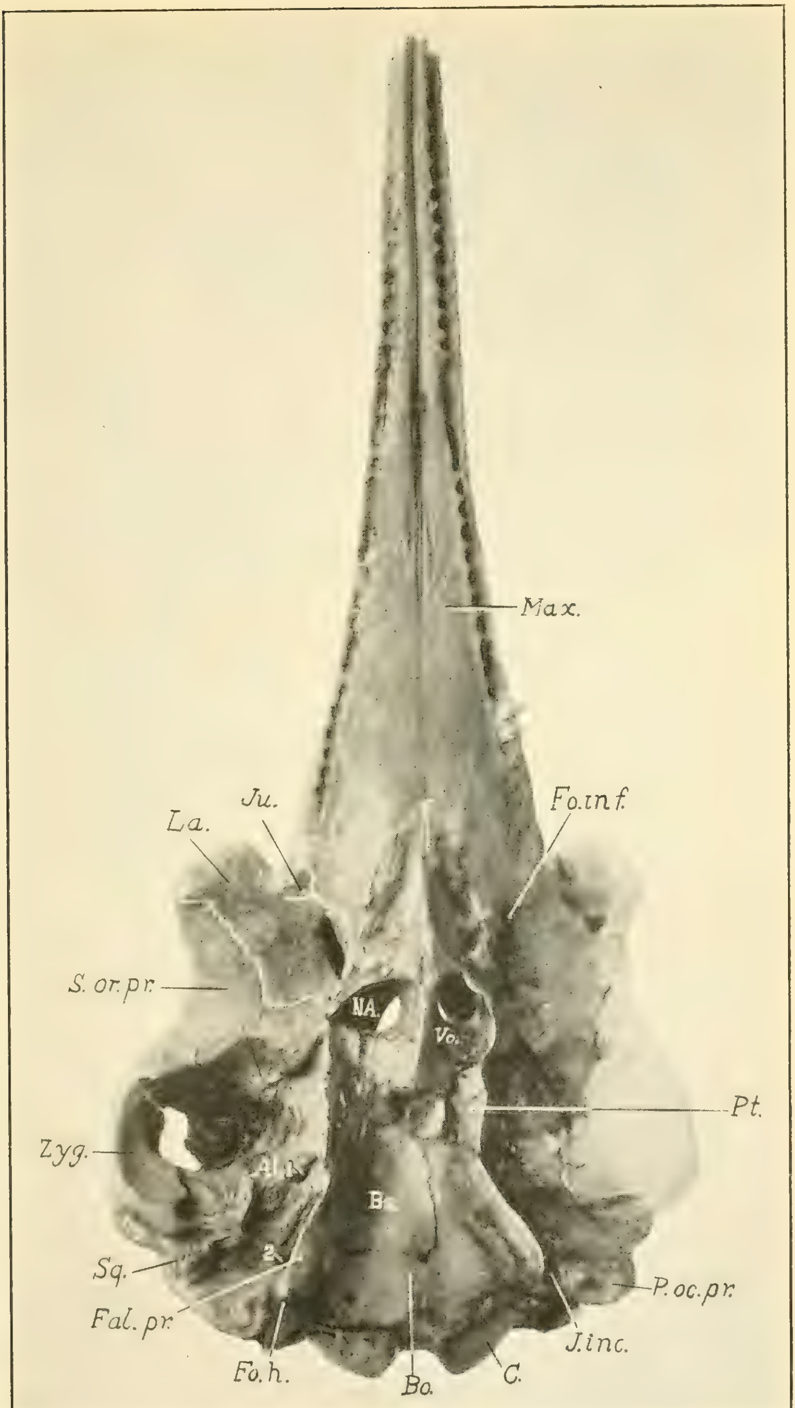

VENTRAL VIEW OF SKULL OF KENTRIODON PERNIX

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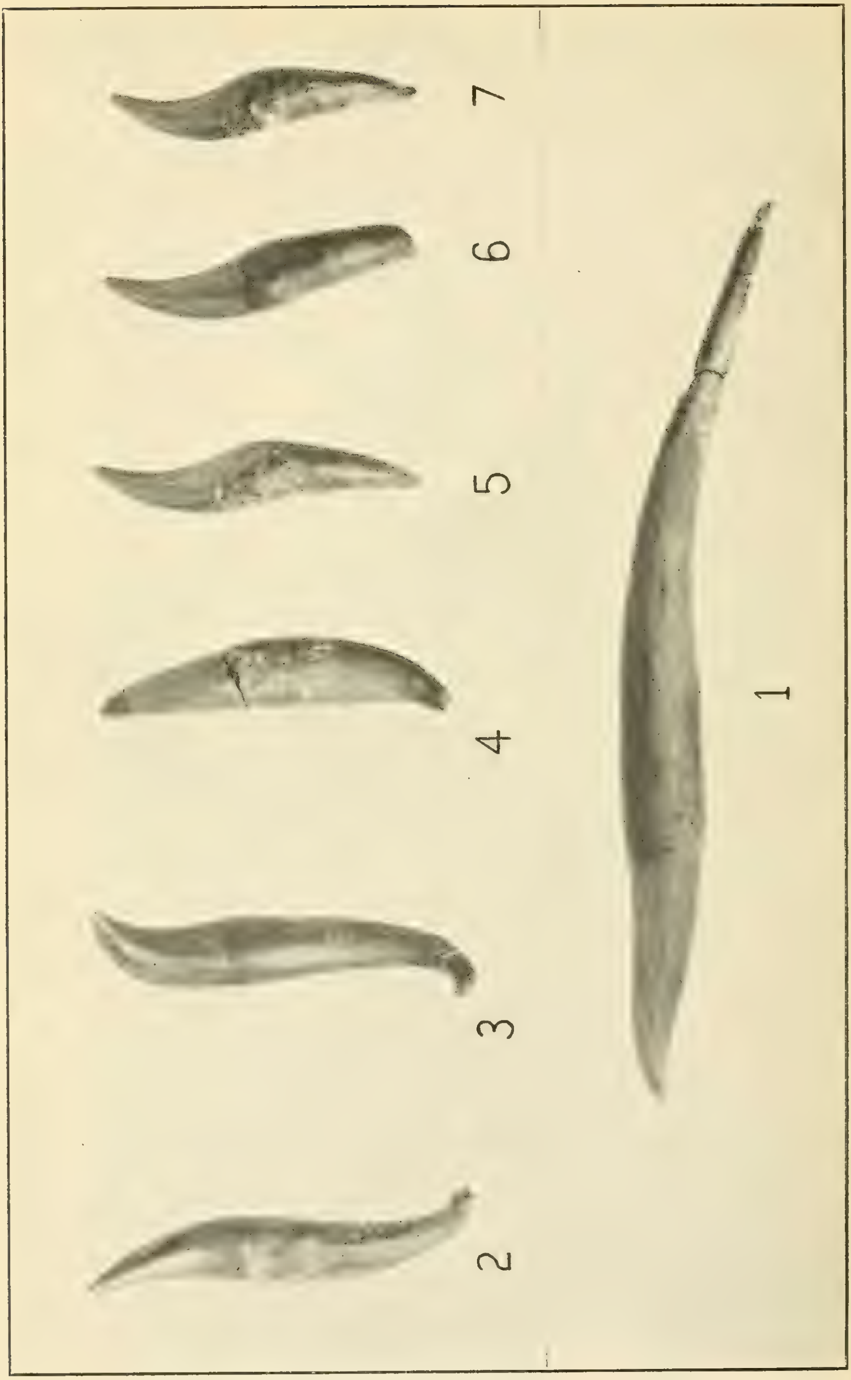

TEETH OF KENTRIODON PERNIX

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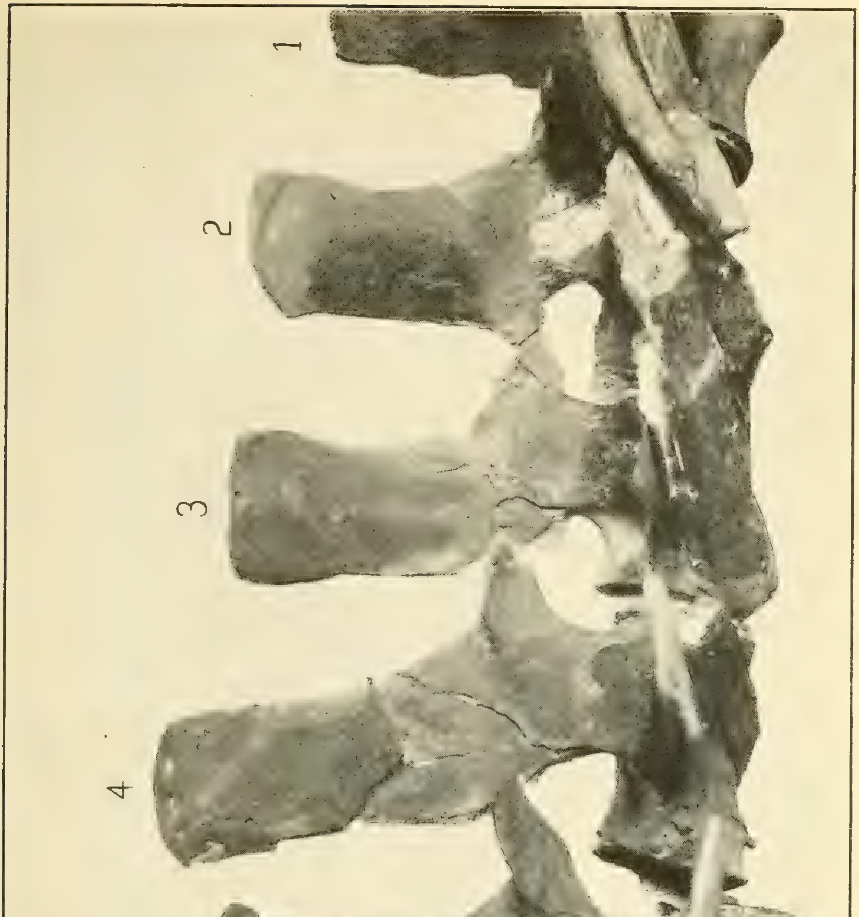

LATERAL VIEWS OF DORSAL AND LUMBAR VERTEBRAE OF KENTRIODON PERNIX

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LATERAL VIEWS OF LUMBAR AND CAUDAL VERTEBRAE OF KENTRIODON PERNIX

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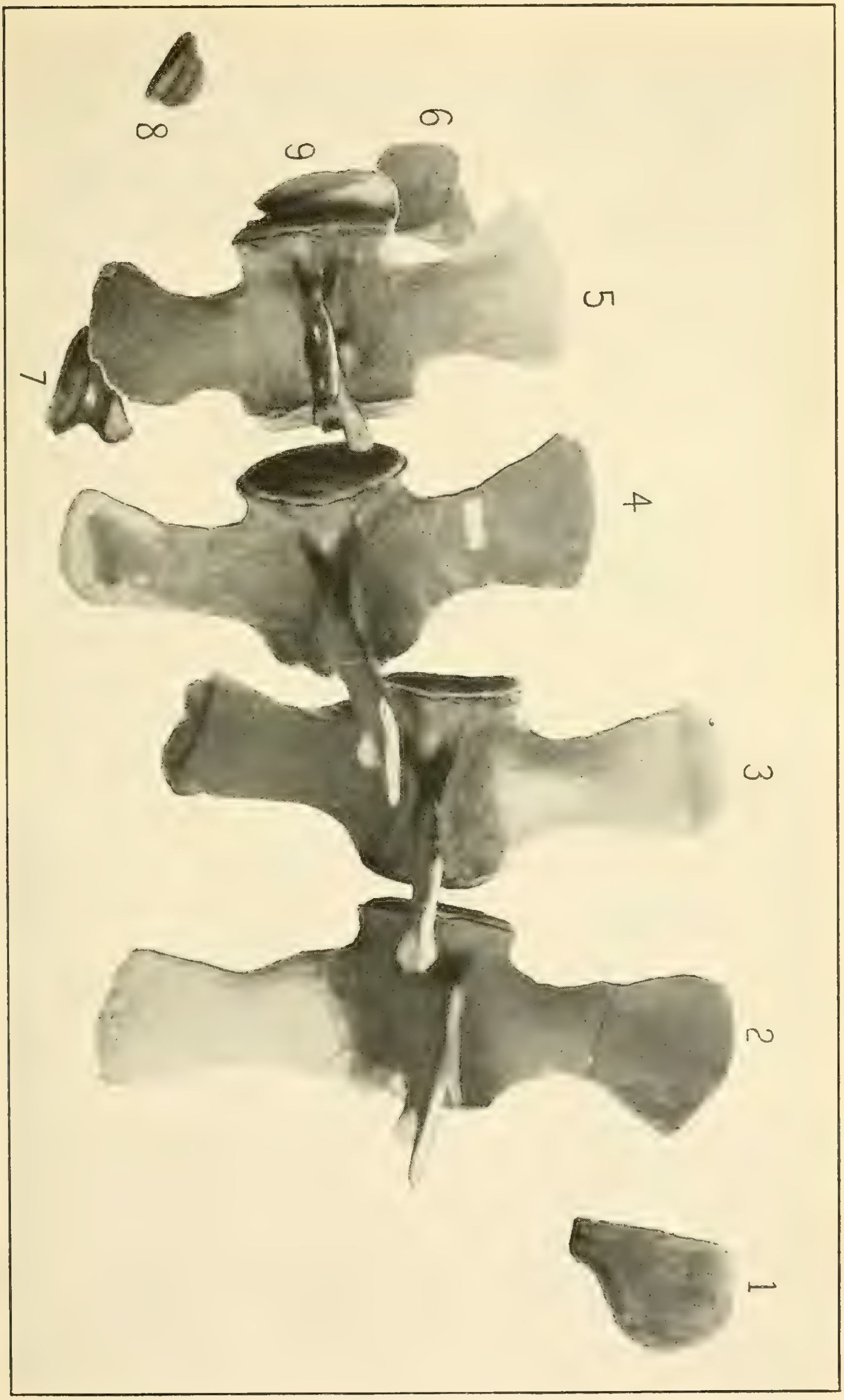

DORSAL VIEWS OF LUMBAR AND CAUDAL VERTEBRAE OF KENTRIODON PERNIX

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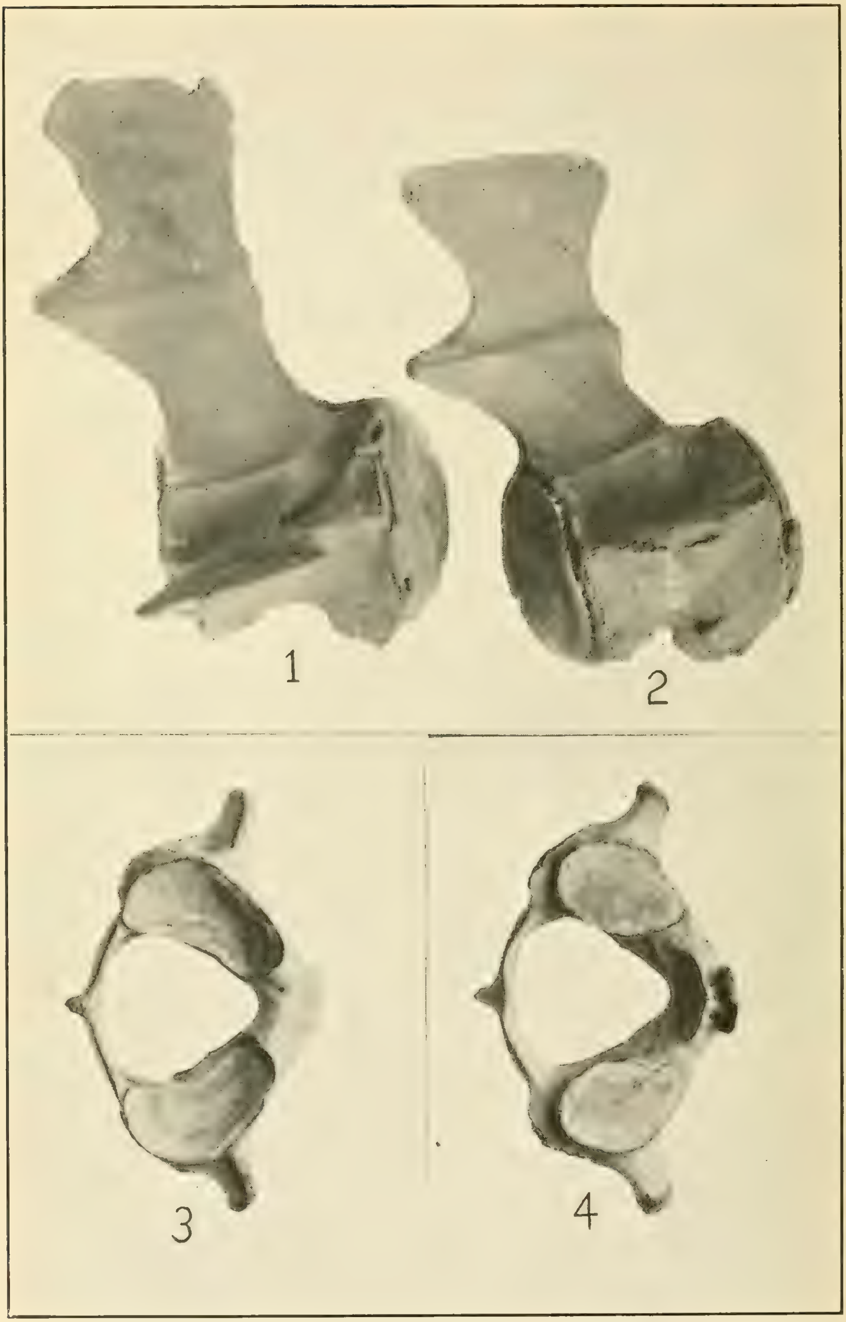

VIEWS OF CAUDAL VERTEBRAE AND ATLAS OF KENTRIODON PERNIX

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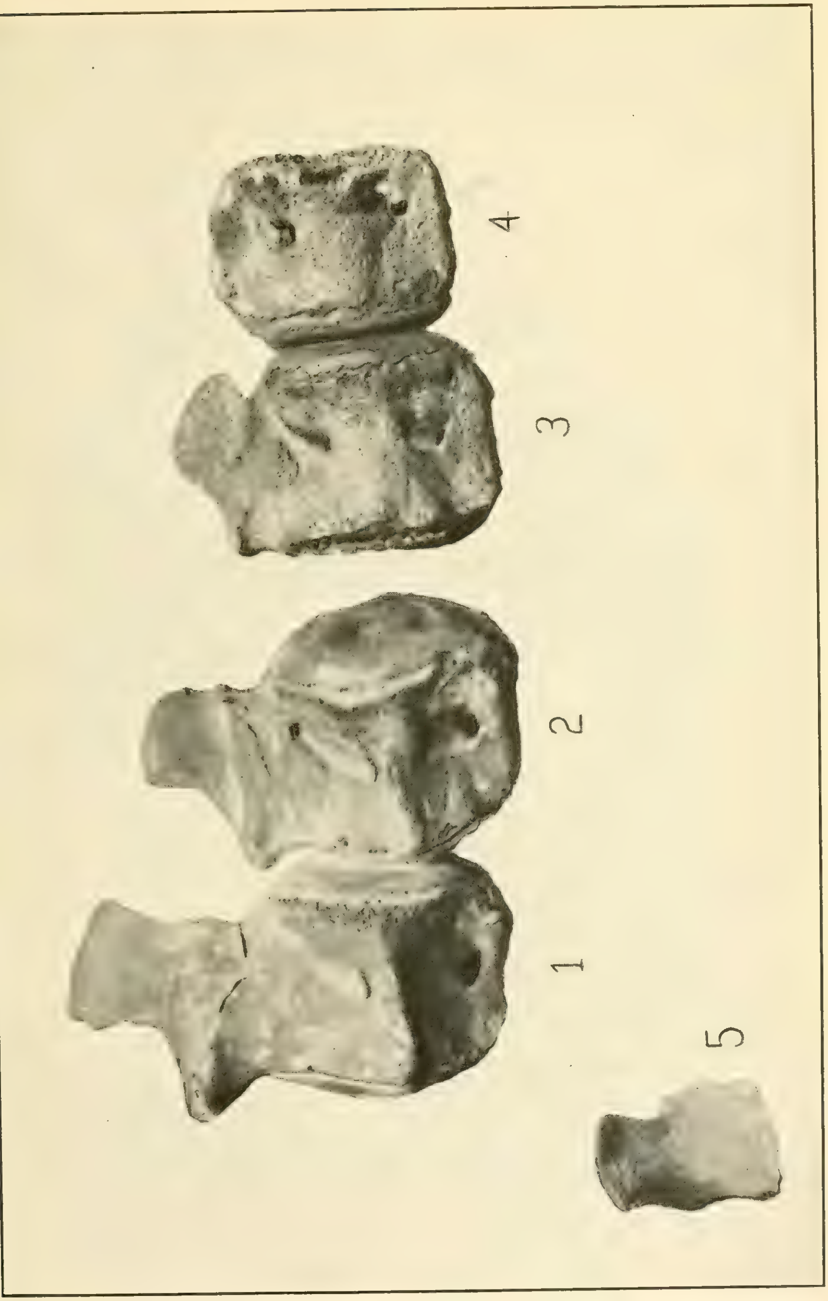

LATERAL VIEWS OF CAUDAL VERTEBRAE AND CHEVRON OF KENTRIODON PERNIX

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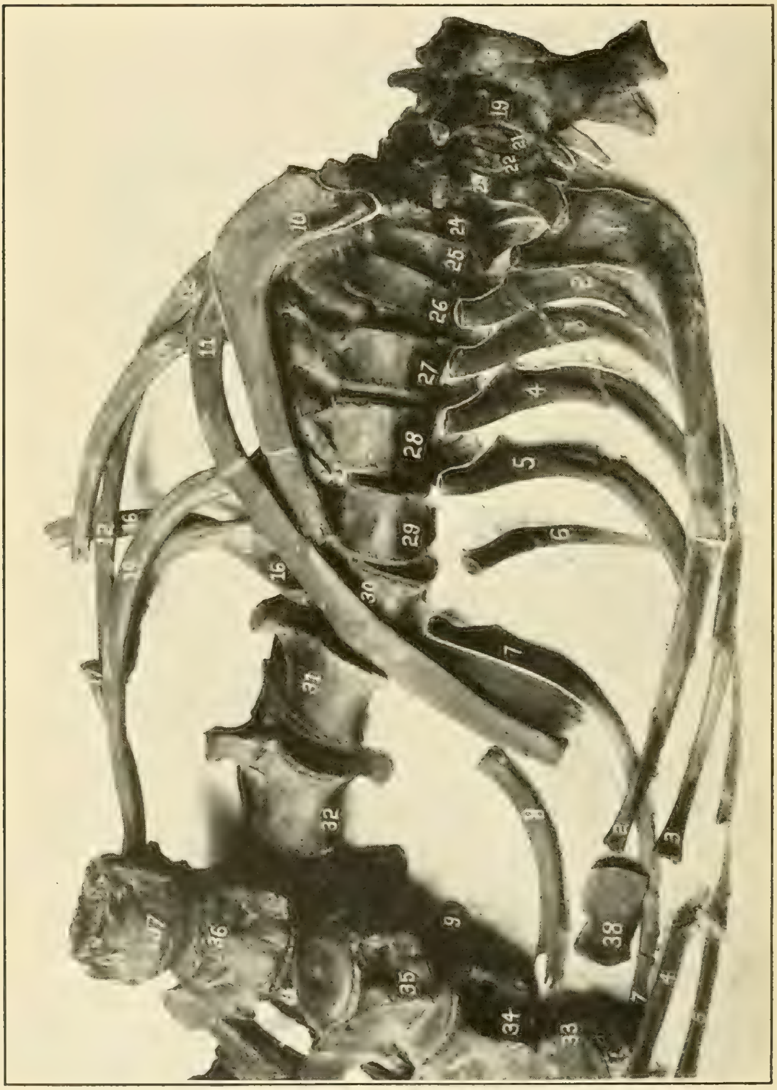

VENTRAL VIEW OF VERTEBRAL COLUMN AND RIBS OF KENTRIODON PERNIX

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ADDITIONAL NEW MOLLUSKS FROM SANTA ELENA BAY, ECUADOR

By Paul Bartsch

Curator, Division of Mollusks, United States National Museum

In the Proceedings of the United States National Museum [1] I had occasion to publish a short paper entitled "New mollusks from Santa Elena Bay, Ecuador." In this 12 new species of Pyramidellids and two of Melanellids collected by Dr. A. A. Olsson in Santa Elena Bay, Ecuador, were described. The finding of so many novelties in the little sending stimulated Doctor Olsson to further search and a second sending, a mere teaspoonful of shells collected on the coast southeast of Punta Santa Elena, Santa Elena Peninsula, Ecuador, yields the many new forms here described, as well as some of those contained in the last sending.

Even with the addition of these species, we venture to say that only a small fraction of the Pyramidellid and Melanellid fauna that the region affords are made known, for in the equivalent geographic faunal areas to the north these groups are wonderfully diversified, and the material now at hand promises that careful search will disclose a large number of additional forms. It is to be hoped too that some one farther south will do a little sifting in suitable places so that we may know something of the fauna of minute things which so far has failed the attention of naturalists.

The species described in the paper cited above are:

Pyramidella (Longchaeus) elenensis.
Turbonilla (Chemnitzia) theone.
Turbonilla (Chemnitzia) cenoa.
Turbonilla (Turbonilla) axeli.
Turbonilla (Strioturbonilla) evagone.
Turbonilla (Strioturbonilla) nychia.
Turbonilla (Strioturbonilla) thyne.
Turbonilla (Pyrgiscus) melea.
Turbonilla (Pyrgiscus) evadna.
Turbonilla (Bartschella) semela.
Odostomia (Chrysallida) olssoni.
Odostomia (Chrysallida) melitta.
Melanella (Melanella) olssoni.
Melanella (Balcis) elenensis.

The only other mollusks belonging to these two families that have been described from Santa Elena Bay were gathered by Hugh

[1] Vol. 66, art. 44, pp. 1–9, pls. 1–2, 1924.

Cuming and published in 1834 by Sowerby in the Proceedings of the Zoological Society of London (pp. 6–8.) They are:

Eulima splendidula, *E. imbricata*, *E. hastata*, *E. pusilla*.

These I referred to the following genera in my Monograph of West American Melanellid Mollusks, published in 1917 in volume 53 of the Proceedings of the United States National Museum:

Niso splendidula Sowerby (p. 348, pl. 48, fig. 5).
Niso imbricata Sowerby (p. 351, pl. 48, fig. 6).
Melanella (*Melanella*) *hastata* Sowerby (p. 317, pl. 38, figs. 4, 6).
Melanella (*Melanella*) *pusilla* Sowerby (p. 317, pl. 38, fig. 2).

PYRAMIDELLA (PHARCIDELLA) AVA, new species

Plate 3, fig. 6

Shell minute, stout, pupoid. Nuclear whorls decollated. Postnuclear whorls slightly rounded, smooth, marked by faint riblets, an occasional varicial streak, and a single deeply incised peripheral spiral groove which is crossed by slender axial threads. This groove falls considerably anterior to the summit of the succeeding turns, leaving a rather broad smooth band between this incised line and the suture. Base well rounded, marked by a continuation of the slender riblets and microscopic spiral striations. Aperture oval; outer lip reinforced within by seven spiral lamellae; columella very stout, short, provided with a strong oblique fold at its insertion, and two very slender much more oblique folds anterior to this.

The type (Cat. No. 363067, U.S.N.M.) has lost the nucleus and probably the first postnuclear whorl. The four and one-half remaining whorls measure, length, 4.1 mm.; diameter, 1.6 mm.

PYRAMIDELLA (TRIPTYCHUS) OLSSONI, new species

Plate 1, fig. 11

Shell moderately large; semitranslucent, bluish-white. Nuclear whorls decollated; postnuclear whorls moderately rounded, strongly tabulatedly shouldered at the summit, marked by three strong rounded spiral cords, of which the first, which is at the summit, is a little stronger than the other two; the third is about as far anterior to the suture as it is distant from the median. In addition to the spiral cords, the whorls are marked by axial ribs which are more strongly developed on the anterior half of the whorls than on the posterior. On the anterior half they cause their junction with the spiral cords to form decided tubercles which are best developed on the median cord; the third cord is not affected by the ribs as far as the formation of the tubercles is concerned, and appears almost smooth; the space between the median and the third cord, and the

space between the third and the base show the ribs as slender raised threads. Of these ribs, 20 occur upon the second and third of the remaining turns, 21 upon the fourth, 24 upon the fifth, 28 upon the sixth, and 34 upon the last turn. Periphery of the last whorl marked by a strong spiral cord a little stronger than the first supraperipheral cord. Base moderately rounded, marked by two strong spiral cords which divide the space between the peripheral cord and the tip of the columella into three equal spaces; these broad spaces between the spiral cords are crossed by slender, threadlike continuations of the axial ribs. Aperture rendered irregular by the strong spiral cords. Outer lip thin, showing the external sculpture within, provided with three slender spiral folds of which the first is between the median and the third, and the second between the third and peripheral cord on the spire, while the third is between the peripheral and first basal cord. Columella very stout, provided with three folds of which the first, which is a little anterior to the insertion of the columella, is very strong and continues over the base as the anterior basal fold, while the other two are slender and much more oblique and rather closely approximated, and almost extend to the anterior terminal point of the columella.

The unique type (Cat. No. 363066, U.S.N.M.) has seven whorls remaining, which measure, length, 5 mm.; diameter, 1.6 mm.

PYRAMIDELLA (SYRNOLA) COLLEA, new species

Plate 3, fig. 7

Shell small, very irregularly elongate-conic, bluish-white, semitranslucent. Early whorls decollated, the four remaining almost flattened, appressed at the summit, marked by incremental lines only. Suture scarcely impressed. The preceding whorl shines through the appressed summit, and the anterior termination of the preceding whorl forms a zone that gives to the shell a false suture effect. Periphery of the last whorl well rounded. Base short, well rounded, smooth. Aperture small, oval; posterior angle acute; the outer lip thickened at the posterior angle and also at the base and slightly so in the middle, forming therefore a rather conspicuous peristome reinforced within by three strong lamellar folds; inner lip stout, reflected over and appressed to the base; parietal wall covered by a moderately thick callus.

The type (Cat. No. 363095 U.S.N.M.) has lost the nucleus and early postnuclear whorls. The four and one-half remaining measure, length, 3.4 mm.; diameter, 1.2 mm. This species strongly suggests a *Melanella*, and would be classified as such were it not for the presence of the spiral lamellae within the outer lip. It will be interesting to see the nuclear turns of this species.

TURBONILLA (CHEMNITZIA) RIMACA, new species

Plate 1, fig. 7

Shell small, elongate-conic, semitranslucent, bluish-white. Nuclear whorls 1½, strongly rounded, smooth, forming a depressed helicoid spire, the axis of which is almost at right angles to that of the succeeding turns, in the first of which almost half of the nuclear spire is immersed. Postnuclear whorls moderately rounded, appressed at the summit, somewhat obscurely angulated at the termination of the anterior third between summit and suture, marked by low, rounded, distantly spaced, almost vertical axial ribs, of which 12 occur upon the first four turns, and 14 upon the rest. The spaces between the axial riblets are shallow, only moderately impressed, and almost three times as wide as the ribs. Suture well marked. Periphery of the last whorl strongly rounded. Base rather long, well rounded, marked only by incremental lines. Aperture oval, very elongated; outer lip thin, showing the external sculpture within, inner lip strongly twisted, bearing a heavy fold at its insertion.

The type (Cat. No. 363068, U.S.N.M.) has six postnuclear whorls and measures, length, 3.2 mm.; diameter, 0.8 mm.

TURBONILLA (STRIOTURBONILLA) HUA, new species

Plate 1, fig. 5

Shell very irregularly elongate-conic, bluish-white, semitranslucent. Nuclear whorls 2.3, strongly rounded, forming a decidedly elevated spire, the axis of which is at right angles to that of the succeeding turns, in the first of which the nuclear spire is about one-third immersed. Postnuclear whorls narrowly shouldered at the summit, moderately rounded, crossed by rather strong, obliquely, protractively slanting axial ribs which are a little more than one-half as wide as the spaces that separate them. Of these ribs, 16 occur upon the second, 18 upon the third, 20 upon the fourth and fifth, and 22 upon the rest of the whorls. The axial ribs terminate rather strongly at the summit, and there appears to be a slight constriction immediately below the summit, which gives to the angle at the summit a somewhat crenulated aspect. The intercostal spaces terminate abruptly at the periphery, and are crossed by numerous microscopic spiral striations. Suture rendered conspicuous by the shoulder at the summit. Periphery well rounded. Base short, well-rounded, marked by incremental lines only. Aperture subquadrate; posterior angle obtuse; outer lip thin, showing the external sculpture within; inner lip almost vertical, slightly twisted, and provided with an oblique fold at its insertion.

The type (Cat. No. 363069, U.S.N.M.) is not quite adult. It has seven postnuclear whorls and measures, length, 3 mm.; diameter, 0.8 mm.

TURBONILLA (STRIOTURBONILLA) ATA, new species

Plate 1, fig. 8

Shell very irregularly elongate-conic, pale brown. Nuclear whorls 2.3, well rounded, forming a depressed helicoid spire whose axis is almost at right angles to that of the succeeding turns, in the first of which it is about one-fourth immersed. The left edge of the nuclear spire projects beyond the outline of the postnuclear spire. Early postnuclear whorls moderately rounded, the later ones almost flattened; the early whorls are somewhat worn in our specimen, and consequently no rib count can be made. The later turns are slightly shouldered at the summit and crossed by slender, almost straight protractively slanting axial ribs of which 20 occur upon the fourth, 22 upon the fifth, 20 upon the sixth to ninth, and 22 upon the last whorl. The spaces separating the axial ribs are about as wide as the ribs and are crossed by a deeply impressed line of pits which is situated about two-fifths of the space between the summit and the suture anterior to the summit. A second line of pits of about equal width, but a little more profoundly impressed, marks the anterior termination of the intercostal spaces. In addition to these two lines of pits, the rest of the intercostal spaces are marked by numerous very fine, closely spaced spiral striations. Suture well impressed. Periphery of the last whorl slightly angulated. Base short, marked by numerous slender closely spaced spiral threads. Aperture elongate-ovate; posterior angle acute; outer lip thin, showing the external sculpture within; inner lip almost straight, provided with a moderately strong fold a little anterior to its insertion.

The type (Cat. No. 363070, U.S.N.M.) has 10½ whorls and measures, length, 6.3 mm.; diameter, 1.4 mm.

TURBONILLA (STRIOTURBONILLA) CACA, new species

Plate 1, fig. 9

Shell elongate-conic, turreted, bluish-white. Nuclear whorls 2½, well rounded, forming a decidedly elevated spire whose axis is at right angles to that of the succeeding turns, in the first of which the nuclear spire is about one-fourth immersed. Postnuclear whorls strongly tabulatedly shouldered at the summit, the rest only slightly rounded, marked by strong retractively slanting axial ribs, of which 18 occur upon the first, 20 upon the second to sixth, 22 upon the seventh, and 24 upon the last turn. The intercostal spaces are about as wide as the ribs, the impressed portion terminating abruptly at the

periphery; they are crossed by numerous very fine closely spaced spiral striations. Suture rendered rather conspicuous by the shouldered summit. Base rather short, well rounded, marked by incremental lines and closely spaced microscopic spiral striations. Aperture subquadrate; outer lip thin showing the external sculpture within; inner lip almost straight and almost vertical; parietal wall covered by a thin callus.

The type (Cat. No. 363071, U.S.N.M.) has 8.8 whorls and measures, length, 5.2 mm.; diameter, 1.3 mm.

TURBONILLA (STRIOTURBONILLA) CAPA, new species

Plate 1, figs. 1, 2

Shell elongate-conic, bluish-white. Nuclear whorls 2½, well rounded, forming a depressed helicoid spire, the axis of which is about one-third immersed in the first of the postnuclear turns. The left outline of the nuclear spire projects slightly beyond the outline of the postnuclear spire. Early postnuclear whorls well rounded, the later ones only slightly rounded, marked by rather strong slightly protractively slanting, quite regular axial ribs, of which 18 occur upon the first 4 whorls, 20 upon the fifth and sixth, 22 upon the seventh, 24 upon the eighth, 26 upon the ninth, and 28 upon the last turn. The intercostal spaces are about as wide as the axial ribs, terminating anteriorly in a deep pit. Another deep pit of less size is situated about two-fifths of the distance between the summit and the peripheral pit anterior to the summit. The space between the peripheral and median pit is crossed by 14 almost equal and almost equally spaced spiral striations, while the space between the summit and the median pit has 13 spiral striations. These are a little finer than those on the anterior portion. Suture well impressed, periphery well rounded. Base short, well rounded, marked by about 15 well impressed spiral striations which are a little more distantly spaced than those posterior to the periphery. Aperture subquadrate, the posterior angle obtuse; outer lip thin showing the external sculpture within; inner lip stout, reflected over and appressed to the base for its posterior third.

The description of the species has been based upon two specimens (Cat. No. 363072, U.S.N.M.). One having the nuclear spire and seven whorls measures; length, 3.3 mm.; greater diameter, 1 mm. The other has the last five whorls and measures, length, 4.6 mm.; greater diameter, 1.6 mm. Between the two there is an overlap of probably one whorl.

Cat. No. 363073, U.S.N.M., contains another specimen from the same locality.

TURBONILLA (PYRGISCUS) TIA, new species

Plate 3, fig. 10

Shell elongate-conic, pale straw-colored, with a broad light zone at the summit and immediately anterior to the periphery, the space between being a trifle darker, practically agreeing with the base in coloration. The type has lost the nucleus and the early postnuclear whorls. The first of the 7½ remaining turns has 20 slightly retractively curved rather distantly spaced axial ribs. There are also 20 on the second and third, 22 upon the fourth, 24 upon the fifth and sixth, and 36 upon the last. Upon this whorl they become rather irregular in development and much more closely spaced than on the earlier turns. On the early whorls the intercostal spaces, which are rather strongly impressed, are about twice as wide as the ribs, while on the last turn they are less than half the width of the ribs. The intercostal spaces are crossed by spiral lines of pits which are of rather irregular strength and spacing; the strongest pit is at the periphery. There are 20 of these incised lines between the summit and the periphery; they are a little closer crowded toward the summit than at the periphery. Suture moderately well impressed. Periphery of the last whorl well rounded. Base moderately long, well rounded, marked by feeble continuations of the axial ribs and by 16 well-incised spiral lines. Aperture moderately large; posterior angle acute; outer lip thin, showing the external sculpture within; inner lip slightly curved and strongly reflected and appressed to the base for about half of its length, and provided with an obsolete fold a little anterior to its insertion; parietal wall covered with a thin callus.

The type (Cat. No. 363074, U.S.N.M.) measures, length, 6.2 mm.; diameter, 1.8 mm.

Cat. No. 363075, U.S.N.M., contains another specimen.

TURBONILLA (PYRGISCUS) INTIA, new species

Plate 3, fig. 9

Shell elongate-conic, early whorls bluish-white, the later ones pale brownish-yellow, deepest on the base. The type consists of the last six whorls, the nucleus and the early whorls being lost. These whorls are almost appressed at the summit and rather high between the summit and the periphery. They are marked by low broad rounded retractively slanting axial ribs, of which 22 occur upon the first to third of the remaining turns, 24 upon the fourth, 26 upon the fifth and the last whorl. On the latter they become almost obsolete. The intercostal spaces are narrow, less than half the width of the axial ribs and but poorly impressed. They are crossed

by seven equal and equally spaced impressed spiral lines. Suture moderately constricted. Periphery of the last whorl well rounded. Base moderately long, well rounded, marked by incremental lines and 10 incised spiral lines, of which the first 3 below the periphery are rather strongly impressed pits, while the rest are much weaker. The first two, that is, the fifth and sixth below the periphery, are closely approximated, while the next three are about twice as far apart as the other two just mentioned. The next pair inclose a space a little narrower than that posterior to it, while the space between the eighth and ninth is about as wide. Aperture small, oval; posterior angle acute; outer lip thin showing the external sculpture within; inner lip rather stout, somewhat twisted, reflected over and its posterior half appressed to the base, parietal wall covered by a rather thick callus.

The type (Cat. No. 363076, U.S.N.M.) measures, length, 6.8 mm.; diameter, 2 mm.

TURBONILLA (PYRGISCUS) COLLEA, new species

Plate 1, fig. 4

Shell of medium size, pale horn-colored, with the anterior half of the base pale brown. Nuclear whorls decollated. Postnuclear whorls appressed at the summit, flattened in the middle, and marked by strong, retractively slanting, somewhat curved axial ribs, of which 18 occur upon the first and second, 16 upon the third and fourth, 18 upon the fifth to seventh, and 24 upon the last turn. The spaces separating these ribs are at least twice as wide as the ribs on all but the last turn, where they become much narrower and about equal the ribs in width. Intercostal spaces are crossed by six strong, rather broad equally incised spiral lines, of which the first and second below the summit are much wider apart than the rest; the spaces between the second and third and third and fourth are about equal, while the spaces separating the fourth from the fifth and fifth from the sixth are about equal and about half as wide as the last two. Suture well impressed. Periphery of the last whorl well rounded. Base moderately long, strongly rounded, marked by the feeble continuations of the axial ribs and eight equal and equally spaced, rather broad spiral striations which are, however, less strong than those on the spire. Aperture small, oval; posterior angle acute; outer lip thin showing the external sculpture within; inner lip somewhat sinuous. provided with a strong oblique fold at its insertion and reflected and appressed to the base for about half of its length; parietal wall covered by a rather strong callus.

The type (Cat. No. 363077, U.S.N.M.) has lost the nucleus and probably the first postnuclear whorl. The eight and one-half remaining turns measure, length, 5.3 mm.; diameter, 1.4 mm.

Cat. No. 363078, U.S.N.M., is another specimen from the same locality.

TURBONILLA (PYRGISCUS) AYA, new species

Plate 1, fig. 10

Shell small, elongate-conic, pale yellow. Nuclear whorls 2½ forming a helicoid spire whose axis is not quite at right angles to that of the succeeding turns, in the first of which it is about one-fifth immersed. Postnuclear whorls slightly rounded, appressed at the summit, marked by moderately strong, rounded, slightly protractively slanting axial ribs, of which 22 occur upon the first and second, 20 upon the third, 18 upon the fourth and fifth, and 20 upon the last turn. The spaces separating these ribs are about as wide as the ribs and crossed by seven equal and almost equally spaced spiral cords. The spaces between the summit and the first, and the first and second, and the third and fourth are a litle wider than the rest, which are equal. Suture moderately well impressed. Periphery of the last whorl well rounded. Base moderately long, well rounded, marked by seven equal and equally spaced incised spiral lines which are less than half the strength of those on the spire. There is a rather broad, smooth band between the first of these and the peripheral series of pits. Aperture small, oval; posterior angle acute; outer lip thin showing the external sculpture within; inner lip somewhat sinuous, reflected over and appressed to the base for almost half its length; parietal wall covered by a thin callus.

The type (Cat. No. 363079, U.S.N.M.) has lost the nucleus and probably the first postnuclear turn. The seven whorls remaining measure, length, 4 mm.; diameter, 1.1 mm. Cat. No. 363080, U.S.N.M. contains two specimens, one of which has served for a description of the nucleus.

TURBONILLA (PYRGISCUS) MARA, new species

Plate 1, figs. 3, 6

Shell small, elongate-conic. Nuclear whorls flesh-colored, the last three pale brown, the rest pale brown near the summit, flesh-colored on the rest of the spire, with the base pale brown. Nuclear whorls 2¾, well rounded, forming a depressed helicoid spire, the axis of which is at right angles to that of the succeeding turns, in the first of which it is about one-fifth immersed. First postnuclear whorls

strongly rounded with mere indications of axial ribs; the second one also strongly rounded with 14 low, rounded, distantly spaced axial ribs; the third and fourth turn are also well rounded and marked with the same number of ribs, while the remaining turns are almost flattened and each marked by 14 very strongly retractively slanting, curved axial ribs. Intercostal spaces broad but lightly impressed, marked by 21 incised spiral lines which become progressively a little wider spaced from the summit to the periphery. Suture well impressed. Periphery of the last whorl with a series of very strongly impressed spiral pits. Base well rounded, marked by numerous closely spaced spiral striations. Aperture rather large, oval; posterior angle acute; outer lip thin, showing the external sculpture within; inner lip somewhat twisted, reflected over and appressed to the base for about half its length; parietal wall covered by a thick callus.

The type (Cat. No. 363081, U.S.N.M.) has seven postnuclear whorls and measures, length 3.3 mm.; diameter, 1 mm.

Cat. No. 363082, U.S.N.M. contains three additional specimens.

TURBONILLA (PYRGISCUS) RIMA, new species

Plate 2. fig. 7

Shell elongate-conic. Nucleus and early postnuclear whorls flesh-colored, the rest yellowish-horn colored. Nuclear whorls 2½, well rounded, forming a large helicoid apex, the axis of which is at right angles to that of the succeeding turns, in the first of which it is scarcely at all immersed: the tilted edge of the nucleus projects slightly beyond the outline of the postnuclear spire on both sides. Postnuclear whorls decidedly high between the summit and the periphery; the first one very high and well rounded, the second and third becoming progressively less rounded, while the rest are flattened. The first postnuclear turn is almost smooth, having scarcely any indication of axial ribs, these being reduced to a few obsolete retractively slanting lines. The second one has poorly developed ribs which are here, as well as on the other whorls to follow, decidedly retractively slanting. There are 26 of them on the second whorl, and from there on the ribs become strong and well rounded, and about as wide as the spaces that separate them. The third whorl has 20, the fourth 22, the fifth 26, and the last 28. The intercostal spaces are rather shallow and are crossed by six broad incised spiral lines which are of almost equal width and spacing. Suture rendered slightly sinuous by the ribs at the summit. Periphery of the last whorl well rounded. Base short, well rounded, marked by the feeble continuations of the axial ribs, which become evanescent before reach-

ing the middle of the base, and by six equal and equally spaced incised spiral lines. Aperture oval, posterior angle acute; outer lip thin showing the external sculpture within; inner lip slightly curved and reflected over and appressed to the base for about half of its length; parietal wall covered by a thin callus.

The type (Cat. No. 363083, U.S.N.M.) has six and one-half postnuclear whorls and measures, length 4 mm.; diameter, 1.1 mm.

TURBONILLA (MORMULA) INCA, new species

Plate 2, fig. 5

Shell elongate-conic, milk-white. Nuclear whorls decollated. Postnuclear whorls appressed at the summit, marked by low, rounded almost vertical axial ribs, of which 22 occur upon the first three of the remaining turns, 24 upon the fourth, 26 upon the fifth, while on the last turn the axial ribs become quite obsolete. Intercostal spaces about as wide as the ribs, marked by a rather conspicuous series of pits halfway between the summit and the suture, and another at the periphery, and numerous fine incised spiral lines between the summit and the median line of pits, and between the median and peripheral line. Suture rendered sinuous by the axial ribs. Periphery well rounded. Base moderately long, well rounded, marked by the continuations of the axial ribs which evanesce after passing the middle of the base, and a number of rather strong incised spiral lines. Aperture moderately large; posterior angle acute; outer lip reinforced within by five strong spiral lamellae; inner lip rather stout, reflected over and appressed to the base for two-thirds of its length, and provided with an oblique fold at its insertion; parietal wall covered by a rather thick callus.

The type (Cat. No. 363084, U.S.N.M.) has lost the nucleus and probably the first postnuclear whorl. The seven and a half whorls remaining measure, length, 4.7 mm.; diameter, 1.4 mm.

TURBONILLA (ASMUNDA) CHURIA, new species

Plate 3, fig. 5

Shell moderately large, elongate-turreted, white. The nucleus and probably the first postnuclear whorls decollated. Postnuclear whorls tabulated at the shoulder, almost flattened, marked by strong, distantly spaced very slightly protractively slanting axial ribs, of which 12 occur upon the first of the remaining turns, 14 upon the second, 16 upon the third to fifth, and 18 upon the last turn. The intercostal spaces are about twice as wide as the ribs, and well impressed. Periphery angulated. Base short, well rounded, marked by the continuation of the axial ribs and a median rather strong spiral cord. Aperture subquadrate; posterior angle obtuse; outer

lip thin, showing the external sculpture within; inner lip rather stout, provided with an oblique fold a little anterior to its insertion.

The type (Cat. No. 363085, U.S.N.M.) has lost the nucleus and probably a fraction of the first nuclear turn. The seven remaining whorls measure, length, 3.2 mm.; diameter, 1.1 mm.

ODOSTOMIA (CHRYSALLIDA) QUILLA, new species

Plate 2, fig. 2

Shell small, elongate-ovate, semitranslucent, bluish-white. Nuclear whorls decollated. Postnuclear whorls flattened, almost appressed at the summit, marked by strong retractively slanting axial ribs, of which 16 occur upon the first and 18 upon the remaining turns. Intercostal spaces a little wider than the ribs, crossed by four series of broad subequal spiral pits. The space between the summit and the first of these is about three times as wide as the spaces that separate the rest, which form rather slender spiral cords that scarcely render the junction with the ribs nodulose. The spaces inclosed between the spiral cords and axial ribs are quadrate pits, having their long axis parallel with the spiral sculpture. The periphery would be deeply channeled were it not for the axial ribs which connect across from the summit of the succeeding turns. Periphery well rounded. Base marked by five almost equal strong spiral cords which are separated by narrow channels. Aperture oval; posterior angle acute; outer lip thin, showing the external sculpture within; inner lip very stout and reflected over and appressed to the base for its entire length and provided with a rather strong oblique fold at its insertion; parietal wall covered with a rather thick callus.

The type (Cat. No. 363086, U.S.N.M.) has almost six whorls and measures, length, 1.8 mm.; diameter, 0.7 mm. Cat. No. 363087, U.S.N.M., contains another specimen. This species is remarkable for its exceedingly strong axial ribs and its rather feeble spiral sculpture; also in having the whorls practically appressed at the summit.

ODOSTOMIA (CHRYSALLIDA) VIRA, new species

Plate 2, fig. 3

Shell small, very elongate-ovate, semitranslucent, milk-white. Nuclear whorls decollated. Postnuclear whorls slightly rounded, narrowly shouldered at the summit, rather high between summit and suture, marked by 18 strong almost vertical axial ribs. Intercostal spaces about one and one-half times as wide as the ribs, crossed by four slender spiral cords which are equal in strength and divide the spaces between them into broadly rectangular well-impressed pits that have their long axis parallel with the spiral sculpture. At the

summit of the turns there is a smooth area a little wider than the four spiral cords mentioned. The spiral cords, in joining the axial ribs, render these slightly tuberculated. Suture moderately impressed. Periphery well rounded. Base very long, moderately rounded, marked by the continuation of the axial ribs, which evanesce after passing the middle of the base, and five spiral cords which are of equal spacing but become somewhat enfeebled. On the posterior half of the base, where the axial ribs are present, the spiral and axial sculpture inclose rectangular pits not unlike those of the spire. Aperture very elongate-oval; outer lip thin, showing the external sculpture within; inner lip very stout, long, reflected over and appressed to the base for almost its entire length, provided with a very strong oblique fold a little anterior to its insertion; parietal wall covered by a moderately thick callus.

The type (Cat. No. 363088, U.S.N.M.) has lost the nucleus and probably the first one and one-half postnuclear turns. The four and one-half remaining turns measure, length, 2.7 mm.; diameter, 1 m. Cat. No. 363089, U.S.N.M., contains two additional specimens.

ODOSTOMIA (CHRYSALLIDA) ATA, new species

Plate 2, fig. 8

Shell moderately large, very elongate-ovate, bluish-white. Nuclear whorls decollated in the type. Postnuclear whorls slightly rounded and shouldered at the summit, marked by strong almost vertical axial ribs, of which 16 occur upon the first, 18 upon the second to fourth, and 16 upon the last turn. Intercostal spaces about one and one-half times as wide as the ribs, crossed by five spiral cords of which the first is really the thickened summit which occupies the space almost three times the width of the remaining four cords, which are equal. The first of the remaining cords is about one-third of the distance between the summit and the suture anterior to the summit. The space separating this cord from the one at the summit is a little wider than the rest which are also equal. The spaces inclosed between the cord at the summit and the first below it and the ribs are almost squarish pits, while the other spaces between the spiral cords and the axial ribs are rectangular pits having their long axis parallel with the spiral sculpture. The junction of the axial ribs and spiral cords form slender tubercles, those at the summit being low and rounded, while the other four are elongated with their long axis parallel with the spiral sculpture. The summits of the whorls are shouldered. Suture well impressed but not broadly channeled, marked by the fifth spiral cord. Base rather long, well rounded, marked by six rather strong well rounded spiral cords which are considerably wider than the spaces that separate them.

The first of these is crossed by the continuation of the axial ribs which cross the second interval but do not cross the second cord. The anterior basal spiral cord is therefore slightly nodulose. Aperture elongate-oval; posterior angle obtuse, somewhat effuse anteriorly; outer lip thin, showing the external sculpture within; inner lip sinuous, reflected over and appressed to the base for three-fourths of its length and provided with a rather conspicuous fold a little anterior to its insertion; parietal wall covered by a rather thick callus.

The type (Cat. No. 363090, U.S.N.M.) has lost the nucleus. It has five and one-half postnuclear whorls and measures, length, 1.7 mm.; diameter, 1.1 mm.

ODOSTOMIA (CHRYSALLIDA) COLLEA, new species

Plate 2, fig. 1

Shell elongate-conic, bluish-milk-white. Nuclear whorls decollated. Postnuclear whorls slightly rounded, appressed at the summit, which falls considerably below the peripheral cord and gives to the whorls a decidedly overhanging appearance. The postnuclear whorls are marked by rather strong axial ribs, of which the early ones are retractively curved and the later slightly protractive. Of these ribs, 18 occur upon the first to third and 20 upon the remaining whorls. The intercostal spaces about one and one-half times as wide as the ribs and rather well impressed and crossed by five spiral cords, of which the first is at the summit and is a little stronger than its neighbor anteriorly, which equals the supraperipheral cord in strength, the third and fourth being a little weaker and more closely approximated. The spaces between the cord at the summit and the first below it and between the fourth and fifth are equal and form a series of broadly rectangular pits, while the space between the second and third is a little narrower and that between the third and fourth is even less in width. The junction of the axial ribs and spiral cords form slender elongate tubercles whose long axis is parallel to the spiral sculpture. On almost all the whorls except the first, the first basal cord is apparent in the suture and on the last two whorls this forms a strong almost smooth band, while the axial ribs extend across the channel separating it from the first supraperipheral cord they do not tuberculate the basal cord. Suture moderately impressed, periphery well rounded. Base of the last whorl well rounded, marked by eight moderately strong spiral cords which become progressively weaker from the periphery anteriorly, and also progressively a little closer spaced, the spaces that separate the spiral cord being always a little wider than the cords. These spaces are crossed by threadlike continuations of the axial ribs. Aperture

broadly oval; posterior angle obtuse; outer lip thin showing the external sculpture within; inner lip reflected over and appressed to the base for about three-fourths of its length, leaving, however, a narrow unbilical chink, and provided with a very strong oblique fold at its insertion; parietal wall covered with a thick callus.

The type (Cat. No. 363091, U.S.N.M.) has six and one-half postnuclear whorls and measures, length, 3 mm.; diameter, 1 mm.

ODOSTOMIA (CHRYSALLIDA) PACHA, new species

Plate 2, fig. 6.

Shell small, semitranslucent, bluish-white. Nuclear whorls decollated. Postnuclear whorls slightly rounded, moderately shouldered at the summit and marked by very strong decidedly retractively slanting axial ribs, of which 14 occur upon the second and 16 upon the rest. Intercostal spaces about one and one-half times as wide as the ribs, well impressed, crossed by four rather strong, equal and equally spaced spiral cords, of which the first is at the summit. These cords pass strongly upon the sides of the ribs and render the summit tuberculated, the tubercles being almost rounded, while the spaces inclosed between the axial ribs and the spiral cords are oval pits having their long axis parallel with the spiral sculpture. Suture rendered channeled by the shouldered summit. In the third to last suture, the peripheral cord becomes apparent, and this increases in strength of exposure until on the last whorl it is fully exposed in the suture. The axial ribs extend strongly across the space separating this cord from the first of the spire which is about as wide as those on the spire, but the ribs do not render it tuberculated. Base short, well rounded, marked by four strong spiral cords not including the one at the periphery. These grow progressively weaker from the perpiheral cord to the one at the tip of the base, and also somewhat closer spaced. The broad channels separating the cords are crossed by numerous slender axial threads. Aperture (?): outer lip fractured; inner lip short, reflected over and appressed to the base and provided with a strong fold at its insertion.

The type (Cat. No. 363092, U.S.N.M.) has six and one-half whorls and measures, length, 2.7 mm.; diameter, 0.9 mm.

ODOSTOMIA (CHRYSALLIDA) CAPA, new species

Plate 2, fig. 4.

Shell very small, very elongate-ovate, milk-white. Nuclear whorls well rounded, smooth, deeply obliquely immersed in the first of the postnuclear whorls above which the tilted edge of the last volution only projects. First postnuclear whorl moderately rounded, the next

two are almost flattened, while the later turns are again slightly rounded, summit of the whorls very narrowly shouldered. The whorls are marked by moderately strong very regular protractively slanting axial ribs, of which 20 occur upon the second and 22 upon the remaining turns. The intercostal spaces are about one and one-half times as wide as the ribs and crossed by five equal and equally spaced spiral cords, of which the first is at the summit. The spaces inclosed between the ribs and spiral cords form almost squarish pits, while their junction form slender rounded tubercles. On the last two turns the peripheral smooth cord is apparent in the suture. The axial ribs extend across the space separating the peripheral cord from the first supraperipheral cord, but scarcely render it tuberculated. Base rather long, somewhat inflated, well rounded, marked by five low rounded spiral cords which are not quite as wide as the spaces that separate them. The first of these is the peripheral cord referred to. These cords grow progressively weaker from the peripheral cord anteriorly and the spaces separating them become a little narrower. Aperture oval; posterior angle acute; outer lip thin showing the external sculpture within; inner lip almost straight, reflected over and appressed to the base, but leaving a very narrow umbilical chink, and provided with a very strong oblique fold at its insertion; parietal wall covered with a thick callus.

The type (Cat. No. 363093, U.S.N.M.) has five postnuclear whorls and measures, length, 2.1 mm.; diameter, 0.8 mm.

ODOSTOMIA (PYRGULINA) MARA, new species

Plate 2, fig. 9

Shell small, very elongate-ovate, bluish-white. Nuclear whorls decollated. Postnuclear whorls slightly rounded, narrowly shouldered at the summit, and crossed by 14 distantly spaced lamellar axial ribs. The spaces separating the ribs are about five times as wide as the ribs and are crossed by five equal and almost equally spaced incised spiral lines. Suture rendered wavy by the strong axial ribs at the summit. Base short, strongly rounded, marked by five equally incised spiral lines which are almost as strong as those on the spire. The first of these is about one-third of the distance between the first supraperipheral line and the tip of the base anterior to the supraperipheral line, thus leaving a broad smooth zone on the posterior portion of the base. The rest of the lines are progressively a little closer spaced from the posterior anteriorly. Aperture small, oval; posterior angle obtuse; outer lip thin showing the external sculpture within; inner lip short, very heavily reflected over and appressed to the base for a little more than half its length, and provided with a rather strong oblique fold at its insertion; parietal wall

covered with a very thick callus which renders the peritreme complete.

The type (Cat. No. 363094, U.S.N.M.) has five and one-half postnuclear whorls and measures, length, 3 mm.; diameter, 1.2 mm.

MELANELLA (BALCIS) CAPA, new species

Plate 3, fig. 2

Shell small, slender, falciform, bluish-white, semitranslucent. Nuclear whorls decollated. Postnuclear whorls appressed at the summit, flattened, marked by incremental lines only; the portion at the summit appressed to the preceding turn, marked anteriorly by a conspicuous zone which gives to the whorls the effect of a double suture; in fact, this line is much more conspicuous than the actual suture which is scarcely apparent. Periphery of the last whorl well rounded. Base moderately long, strongly rounded on the left margin. Aperture moderately large, pear-shaped; posterior angle decidedly acute; outer lip slightly protracted in the middle into a clawlike element; inner lip somewhat curved, reflected over and appressed to the base for its entire length.

The type (Cat. No. 363097, U.S.N.M.) has eight whorls, having lost the nucleus and probably the first postnuclear whorls, and measures, length, 3.8 mm.; diameter, 1.4 mm.

MELANELLA (BALCIS) TIA, new species

Plate 3, fig. 1

Shell broadly conic, stout, thick, semitranslucent, bluish-white. Nuclear whorls decollated. Early postnuclear whorls slightly rounded, the rest flattened; the portion appressed to the preceding turn at the summit is limited by a conspicuous line which gives to the whorls a double sutured aspect. Suture well marked. Periphery of the last whorl short, inflated, and well rounded. Base short, well rounded. Aperture oval; posterior angle acute; outer lip thin; inner lip short, stout, reflected over and appressed to the base for two-thirds of its length; parietal wall covered by a moderately thick callus.

The type (Cat. No. 363096, U.S.N.M.) has seven and one-half whorls and measures, length, 3.9 mm.; diameter, 1.5 mm.

STROMBIFORMIS HUA, new species

Plate 3, fig. 3

Shell moderately large, acicular, slender, bluish-white, semitranslucent, showing the internal structure. Nuclear whorls decollated. Postnuclear whorls flattened, appressed at the summit, the appressed

portion passing over the preceding whorl as a slight glaze. The anterior limit of the appressed portion shows through the shell as a false suture which is far more conspicuous than the actual suture which is scarcely perceptible. Periphery well rounded. Base long, well rounded. Aperture very long, pear-shaped; posterior angle acute; outer lip protracted in the middle; inner lip long, slightly concave, reflected over and appressed to the base for its entire length; parietal wall covered with a thick callus that renders the peritreme complete.

The type (Cat. No. 363098, U.S.N.M.) has six and one-half whorls and measures, length, 4.2 mm.; diameter, 1.1 mm. Cat. No. 363099, U.S.N.M., contains an additional specimen.

STROMBIFORMIS INCA, new species

Plate 3, fig. 11

Shell acicular, large, thin, semitranslucent. Nuclear whorls decollated. Postnuclear whorls high between summit and suture, almost flattened, marked by incremental lines only excepting an occasional varix placed at irregular intervals. Summit of the whorls appressed and exceedingly attenuated so as to form an almost invisible suture. The posterior limit of the interior of the whorls shines through at the summit and gives an appearance of a suture which is far more conspicuous than the real suture. Periphery slightly rounded. Base rather long, moderately rounded. Aperture long, pear-shaped; outer lip thin (fractured): inner lip reflected and appressed to the base; parietal wall covered by a rather thick callus.

The type (Cat. No. 363100, U.S.N.M.) has lost the nucleus and probably the first one and one-half postnuclear whorls. The eight and one-half remaining measure, length, 8.1 mm.; diameter, 1.7 mm.

STROMBIFORMIS SALSA, new species

Plate 3, fig. 4

Shell of medium size, acicular. Nuclear whorls decollated. Early postnuclear whorls moderately rounded, the later ones flattened, thin, semitranslucent, flesh-colored, with two irregularly developed bands of brown, one of which marks the periphery; the other is a little nearer the peripheral zone than the summit. In addition to this there are irregularly distributed varicial streaks of brown which terminate abruptly at their left margin and fade into inconspicuousness to the right, the summit of the whorls appressed and so attenuated as to form a scarcely perceptible suture. The posterior limit of the interior of the whorls shines through the substance of the shell as a conspicuous line which appears as a false suture which is

far more marked than the real suture. Periphery well rounded. Base rather long, well rounded, the posterior half flesh-colored, the anterior half brown. Aperture pyriform; the posterior angle decidedly acute; outer lip slightly protracted in the middle; inner lip oblique, slightly curved, reflected over and appressed to the base; parietal wall covered with a thick callus which renders the peritreme complete; edge of the outer lip brown.

The type (Cat. No. 363101, U.S.N.M.) has nine and one-half whorls and measures, length, 6.5 mm.; diameter, 1.6 mm. Cat. No. 363102, U.S.N.M., contains another specimen.

STROMBIFORMIS PARIA, new species

Plate 3, fig. 8

Shell large, acicular, varying in color from bluish-white to brown. Nuclear whorls decollated. Early postnuclear whorls moderately rounded, the latter flattened. Summit of the whorls exceedingly attenuated and appressed. The posterior limit of the body cavity shines through the substance of the shell and appears as a false suture. The surface of the shell is marked by incremental lines and irregularly distributed varices. Periphery of the last whorl well rounded. Base rather long, attenuated, well rounded. Aperture pyriform; posterior angle acute; outer lip thin, slightly protracted in the middle; inner lip rather stout, reflected over and appressed to the base; parietal wall covered by a thick callus which renders the peritreme complete.

The type (Cat. No. 363103, U.S.N.M.) has seven and one-half whorls and measures, length, 10.3 mm.; diameter, 2.5 mm. Cat. No. 363104, U.S.N.M., contains eight additional specimens.

EXPLANATION OF PLATES

(All figures are those of the types)

PLATE 1

PLATE 2

PLATE 3

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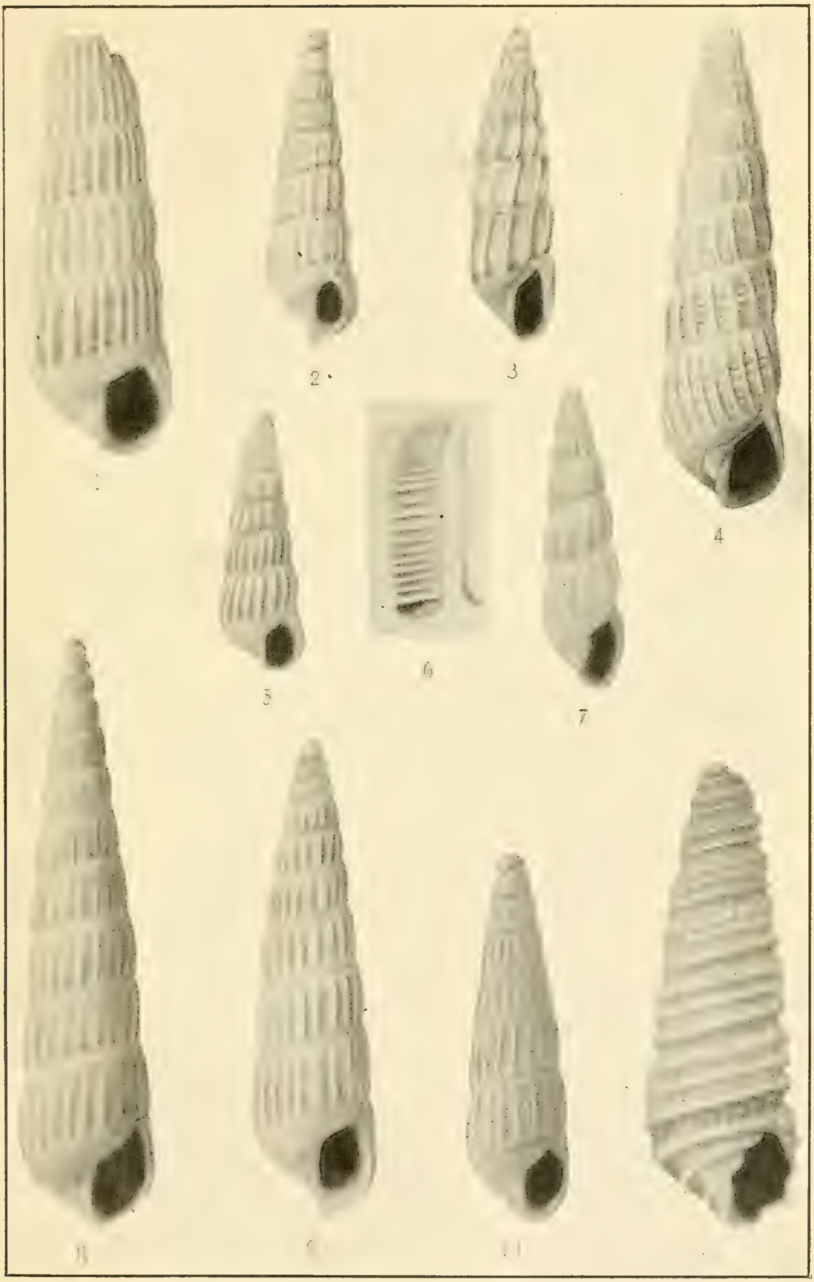
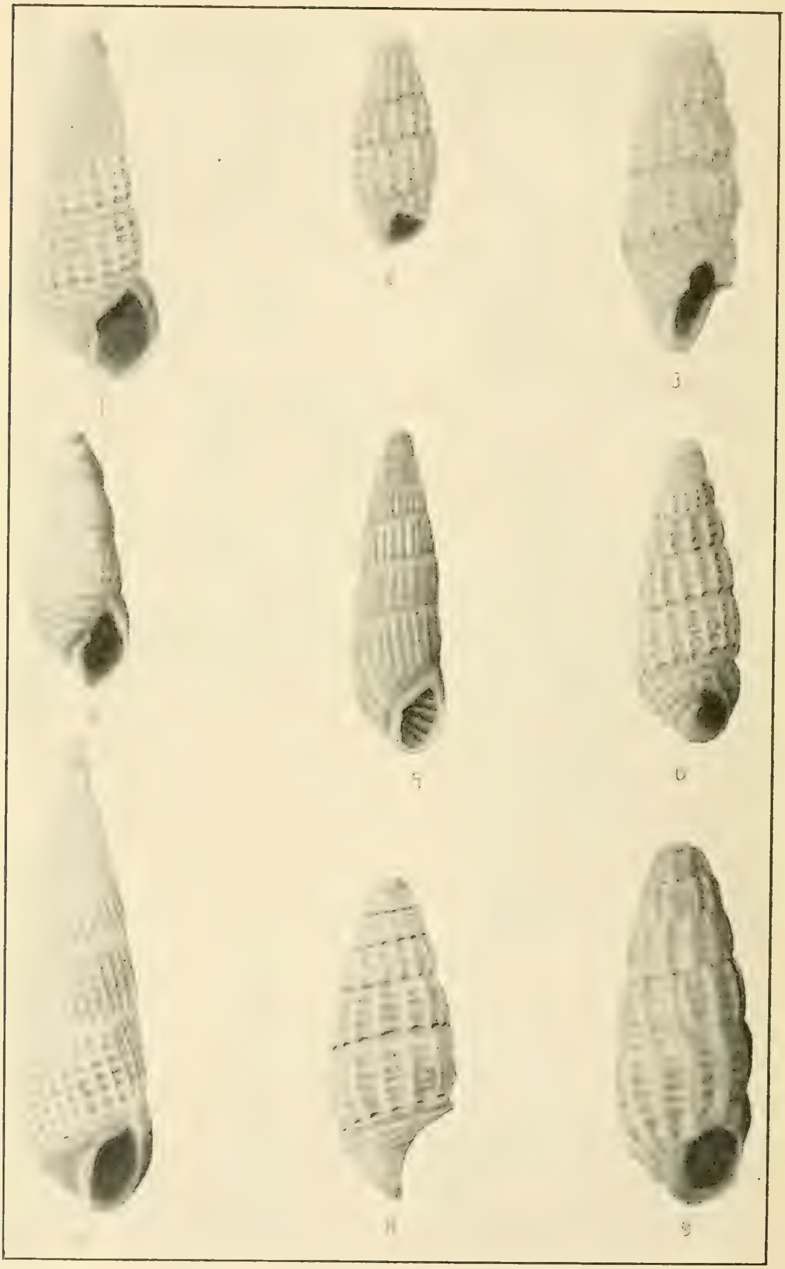


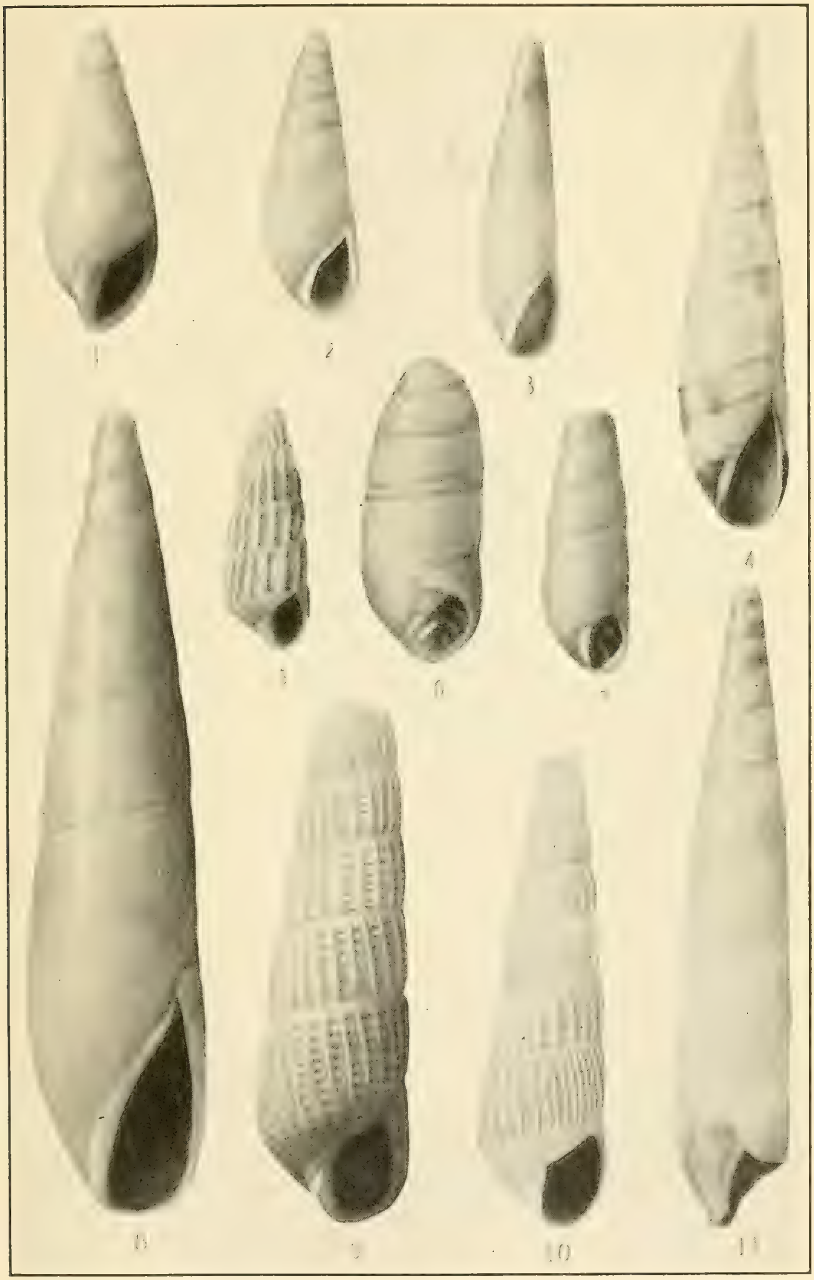
MOLLUSKS FROM SANTA ELENA BAY, ECUADOR

FOR EXPLANATION OF PLATE SEE PAGE 19



Mollusks from Santa Elena Bay, Ecuador

For explanation of plate see page 20



MOLLUSKS FROM SANTA ELENA BAY, ECUADOR

FOR EXPLANATION OF PLATE SEE PAGE 20

DISTRIBUTIONAL NOTES ON SOME NEOTROPICAL BUGS OF THE FAMILY NABIDAE, WITH DESCRIPTION OF A NEW SPECIES

By Halbert M. Harris

Of the Iowa State College, Ames, Iowa

The writer has recently been privileged to examine some undetermined nabids belonging principally to the United States National Museum. Among this material he has been able to recognize an apparently new species of *Nabis* and specimens of other species collected from heretofore unrecorded localities.

1. ALLOEORHYNCHUS VITTATIVENTRIS Stål

Guatemala: Cacao, Alta V. Paz, April, 1917, Schwarz and Barber, collectors.

2. ALLOEORHYNCHUS TRIMACULA Stein

Guatemala: Cacao, Trece Aguas, Alta V. Paz, 30–3, Barber and Schwarz, collectors.

3. PAGASA LUTEICEPS Walker

Panama: Tobago Island, July 4, 1907, Aug. Busck, collector.

4. ARACHNOCORIS ALBOMACULATA Scott

Panama: Tabernilla, Canal Zone, July 4, 1907, A. Busck, collector.

5. PARACHNOCORIS CHLOROPTERUS Reuter

Parachnocoris chloropterus Reuter, Mem. Soc. Ent. Belg., vol. 15, 1908, p. 129.

Female.—Elongate, testaceous, pilose, shiny, a median anteriorly widening longitudinal stripe on head, a spot behind each eye, two longitudinal lines on pronotum, with pronotal humeri, basal half of scutellum, clavus, inner apical angle of corium, membrane, apices of segments I and II and all of segment III of antennae, and apices of tibiae and tarsi embrowned. Pronotal collar, posterior lobe of pronotum, and coria greenish.

Head short; eyes small, finely granular, their distance apart equal to width of one; antennæ slender, lengths of segments in propor-

tion I:II:III::32:34:30 (IV missing), I longer than head and anterior lobe of pronotum conjoined. Rostrum extending to posterior coxæ, segment I as long as thick, II and III subsequal, each twice as long as IV. Pronotum broader than long, collar short, anterior lobe arched, shiny; posterior lobe strongly raised, evenly punctate, humeri rounded, basal margin reflexed and emarginate. Legs long, anterior and intermediate femora of equal thickness and uniformly thick throughout their lengths, provided beneath and above with long slender spines. Anterior tibiae longer than anterior femora. Abdomen beneath thinly clothed with fine hairs, not sharply set off from connexivum. Genital segments large, strongly keeled, ovipositor very prominent. Length 6 mm. Width 1.4 mm.

Described from one specimen (allotype) bearing the label, R. J. Crew, 5–6–'01, Demerara. In National Museum.

The genus *Parachnocoris*, apparently intermediate between the genera *Arachnocoris* Scott and *Nabis* Latreille, was erected for a single species (*P. chloropterus* Reuter)[1] described from a male specimen (holotype) collected by R. J. Crew (Crow?), Demerara. The genus is characterized by the head being distinctly declined anterior to the eyes and produced posteriorly into a short parallel-sided column, the pronotum being as wide as long, constricted distinctly before the middle, with collar short, anterior lobe arched, smooth and shiny, posterior lobe strongly raised, thickly and evenly punctate, hind margin slightly reflexed and emarginate. Hemielytra with veins obsolete. Anterior and intermediate femora long, slightly incrassate, equally thick throughout their lengths and armed beneath their apical halves with a double row of moderately long, remotely spaced spines.

6. NABIS SORDIDUS Reuter

Mexico. Tamos, December 7, 1908, F. C. Bishopp, collector; Oxaco, September, 1918, L. O. Howard, collector. Panama: Paraisa, Canal Zone, April 24, 1911, Aug. Busck, collector. Cuba: Santiago de Las Vegas, February 22, 1923, B. Baretta, collector. West Indies: Grenada, Paraisa, H. H. Smith; Southern Francisco Mountains, Santo Domingo, September 15, 1905, Aug. Busck, collector.

7. NABIS SPINICRUS Reuter

Panama: Tabernilla, Canal Zone, May, July, 1907, Aug. Busck, collector; Paraisa, Canal Zone, January 16, 1911, Aug. Busck, collector. British Guiana: Essequebo R., July, 1921, Aug. Busck, collector. West Indies: Southern Francisco Mountains, Santa Domingo, September, 1905, Aug. Busck, collector.

[1] Mem. Soc. Ent. Belg., vol. 15, 1988, p. 29.

8. NABIS CONSTRICTUS Champion

Guatemala: Cacao, Treec Aguas, Alta V. Paz, Schwarz and Barber, collectors. Mexico: Frontera, Tobasco, June 1897, Townsend, collector.

9. NABIS PANAMENSIS, new species

Moderately elongate, pubescent, testaceous, an anteriorly widening longitudinal stripe on head, a faint median longitudinal line on pronotum, with humeri of pronotum, tip of scutellum, veins of hemielytra (somewhat interrupted), segment I of rostrum, sides of thorax, basal segments of venter and median portion of genital segment embrowned. Antennae, rostrum, and legs stramineous, femora with a reddish to brown band on their posterior surfaces one-third from the apices.

Head short, length of preocular part no greater than that of an eye, postocular part not produced. Eyes large, reddish, coarsely granular, their distance apart equal to width of one of them. Ocelli small. Antennae slender, reaching to about middle of hemielytra, segment I and anterior lobe of pronotum subequal in length, I and II slightly thickened toward their apices, all clothed with fine, slender hairs (I most sparingly), proportion in length I:II:III:13:16:13. Rostrum slender, extending to middle of mesosternum, segment I as broad as long, II, III, and IV in proportion 13:9:5; II and I of antennae subequal in length.

Pronotum broader than long, constricted slightly behind the middle, collar wide, anterior lobe arched; collar, with disk and sides of posterior lobe coarsely punctate. Mesopleura sericeous, opaque, rugulose, and obsoletely and coarsely punctate. Metapleura dull, coarsely wrinkled, canals of odoriferous orifices elongately rectangular, strongly raised and shiny. Legs slender, clothed with fine hairs; anterior femora moderately incrassate, furnished beneath with slender hairs, some of which are longer and stiffer than others. Scutellum broader than long, bifoveate on disk, the posterior half raised, its apex fuscous. Hemielytra extending well beyond abdominal apex, constricted before the middle and clothed along costal margins with long hairs. Clavus coarsely punctate along its light-colored veins, the commissure equal to anterior pronotal lobe in length. Corium with veins embrowned, prominent along their apical two-thirds, inner and outer closed apical cells subequal in length and breadth, all veins sparsely beset with long, semierect hairs. Membrane with several longitudinal veins.

Venter clothed with fine hairs, connexivum narrow, not sharply delimited. Genital segment large. Male clasper with a narrow oblong stem and a curved hook-like blade. Length: (to tip of abdomen) 3.6 mm. to 3.9 mm.; width, 0.82 mm. to 0.91 mm.

Holotype.—Male, Porto Bello, Panama, February 25, 1911, E. A. Schwarz, collector.

Allotype.—Porto Bello, Panama, February 20, 1911, E. A. Schwarz, collector. Both types in the United States National Museum.

Types.—Cat. No. 40082 U.S.N.M.

This species is the smallest of the members of the genus *Nabis* known to me. It apparently belongs with Reuter's subgenus *Lasiomerus*, which includes *N. annulatus* Reuter, *constrictus* Champion, *spinicrus* Reuter, and *villosipes* Stål (*villosipes* not known to me). It agrees with the first three in its general coloration and appearance (though being not quite so elongate), in its constricted hemielytra which are clothed along their costal margin with slender hairs, in the punctate collar and posterior lobe of the pronotum, and finally in the character of the hairs on the under surface of the anterior femora and the general shape of the male clasper. From these species, however, it differs in the shorter head which is not produced and not parallel sided behind the eyes, the arched anterior lobe of the pronotum, and the form of the canals leading from the odoriferous orifices.

10. METATROPIPHORUS BELFRAGII Reuter

Cuba: Santaiago de Las Vegas, October 15, 1923, J. Acuna, collector. Mississippi: Woodville, July 26, 1921, C. J. Drake, collector. Illinois: Dubois, July 3, 1909.

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DESCRIPTIONS OF NEW AND LITTLE KNOWN DIPTERA OR TWO-WINGED FLIES

By J. M. Aldrich,

Associate Curator, Division of Insects, United States National Museum

The following descriptions of new genera and species, with notes on some previously described forms, are based upon material received from several sources, which are indicated in every case.

FAMILY CYRTIDAE

Genus OCNAEA Erichson

Ocnaea Erichson, Entomographien, 1840, p. 155.—Cole, Trans. Amer. Ent Soc., vol. 45, 1919, p. 23.

OCNAEA FLAVIPES, new species

Male.—Head black, almost all included in the eyes, except the back; ocelli two; antennae blackish, the third joint reddish on the median side, deeply grooved on the lateral one, about five times as long as the two preceding taken together; palpi small but distinct, yellow; eyes with long brown pile. Thorax black or very dark brown in ground color, covered with a long pile which is yellow except on the middle of the dorsum, where it is mixed with blackish. Pleurae more brown than black; humeri whitish yellow; the postalar ridge extending from the root of the wing to the scutellum is brown. Calypters convex, translucent, with yellow border

Basal segment of abdomen brown, mostly concealed, with narrow pale hind border; second segment shining black on the dorsum except a narrow reddish hind border which widens toward the sides to include about half the length of the segment; third segment with somewhat shield-shaped black spot in the middle, not quite reaching the hind edge; fourth segment with a small oval black spot, not quite reaching the front edge and considerably separated from the hind edge; fifth segment with median narrow black stripe extending about two-thirds of its length; sixth segment with indistinct blackish spot in the middle; all the remainder of segments three to six is reddish-

yellow. The venter is paler yellow, except the basal part of the first three segments. Legs yellow, the femora indistinctly vittate with brown on the lower hind side. Hind tibiae brown, stouter than the others and ending in two sharp but stout points. Palpi yellow, the apical half of the last joint black; claws black; pulvilli yellowish. Wings hyaline, third vein with a branch near tip forming two submarginal cells; first posterior cell with a cross vein joining the third vein a little before its fork. The extra cell thus cut off is closed before the margin. Five posterior cells present, the veins separating them all extending to the margin; fourth posterior and anal closed before the margin.

Length, 8.4 mm.

Described from one male collected at Port au Prince, Haiti, by G. N. Wolcott.

Type.—Male, Cat. No. 28908, U.S.N.M.

Family MILICHIIDAE

MICROSIMUS, new genus

Nearest to *Neophyllomyza*, but has the front broad and swollen, the eyes small, the antennae considerably separated at base by the lunule, which is bristly; terminal joint of proboscis not so elongate and slender; several bristles on cheek near vibrissa.

Head broad and short, deeply concave behind, so that the vertex forms a rather sharp rim. The broad front consists of wide parafrontals and a large ocellar triangle, which are connected by a narrow area of less striking structure. Besides the two verticals (the outer divergent, the inner convergent) there are three upper frontals divergent and two or three lower convergent, all some distance from the eye; the convergent postverticals are large and strong, the ocellar divergent. The ocellar triangle reaches nearly to the lunule and bears a few reclinate hairs anteriorly. The lunule is broader than usual but mostly concealed above; it bears two proclinate bristles at its upper edge which have the appearance of being on the front. The antennae are separated at base and strongly bent laterally, the second joint as long as the third, both somewhat enlarged in the male; third joint round, arista short plumose. Palpi much enlarged, hairy; proboscis with terminal joint distinctly bent back and slender in the male, much less so in the female. Eyes microscopically pubescent, smaller in the male than in the female, the cheek being fully equal to the eye height in the male, but only half the eye height in the female Chaetotaxy of thorax: Acrostichal, 1; dorsocentral, 2; humeral, 2; posthumeral, 1; presutural, 0; notopleural, 2; supraalar, 2; intraalar, 0; postalar, 2; scutellum, with two pairs; prothoracic, 1; mesothoracic, 0; sternopleural, 0, 1. The disk of the mesonotum is covered with

uniform hairs arranged in rather irregular rows, there being about 10 rows between the dorsocentrals. The scutellum is bare and flat. Wing as in *Neophyllomyza;* the auxiliary vein rudimentary, the first vein very short, costa slightly broken in two places before the first vein; second, third, and fourth veins parallel and ending in the apex; last section of fourth vein about two and a half times the preceding; second basal cell separated by a cross vein from the discal; anal cell very indistinct.

Type of genus.—*Microsimus luteus,* new species.

MICROSIMUS LUTEUS, new species

Female.—Color wholly luteous, including antennae, palpi, proboscis, halteres, and legs. Wing subhyaline with yellow veins. Legs with numerous brownish bristly hairs, the middle tibia with a long apical spine.

Male.—Somewhat darker in color, the front being brown, the thorax, abdomen, and legs brownish yellow. In the male the wing has a striking long fringe of hairs beginning before the apex and extending around the hind margin; these hairs are nearly as long as the hind cross vein.

Length, female 2.2–2.4 mm., male 2 mm.

Described from four females (including type) and one male (allotype) collected by Dr. William M. Mann in 1921 and 1922 while on the Mulford Biological Exploration. Three females, including the type, and one male were taken at Isiamas, Bolivia, in December, 1921, from the nest of the ant *Crematogaster stolli;* one additional female was taken at Rurrenabaque, Beni, Bolivia.

Type.—Cat. No. 28927, U.S.N.M.

Family TRYPETIDAE

Genus PELMATOPS Enderlein

Pelmatops ENDERLEIN, Zool. Jahrbücher, vol. 33, 1912, p. 355.

PELMATOPS ICHNEUMONEA Westwood

Achias ichneumoneus WESTWOOD, Trans. Ent. Soc. Lond., vol. 5, 1850, p. 235, pl. 23, figs. 8, *a, b, c, d.*—OSTEN SACKEN, Ann. Mus. Genoa, vol. 16, 1881, p. 74.

Pelmatops ichneumonea ENDERLEIN, Zool. Jahrb., vol. 33, 1912, p. 355.—HENDEL, Wien, Ent. Ztg., vol. 33, 1914, p. 74; Abhandl. Zool. Bot. Ges. Wien, vol. 8, 1914, Heft 1, p. 219.

This is the type species of *Pelmatops,* and the only one at present known to belong to it; it was originally described from a male and a female in the Saunders collection, and a male in that of Westwood. No other specimens have ever been reported, as far as I know, and the references above are all in the nature of comments on Westwood's figures; even the establishment of the genus is no exception.

Osten Sacken perceived that the species could not belong to *Achias*, and Hendel referred it to the family Trypetidae.

The locality originally given was simply "East Indies." Our specimen is from western China. It is easily identifiable by the characters mentioned and figured by Westwood.

Female.—Eyestalks each about 4 mm. long, extending obliquely forward, diverging from each other at an angle of about 95°; each stalk bears a black stripe above and one in front; aside from these stripes and a slight darkening in the largest portion of the abdomen the color is wholly reddish yellow. The head is globose and the stalks arise from the anterior portion, giving a very different effect from *Achias*, *Richardia*, etc. Directly behind the stalk the side of the head is transparent over a large area. The ocellar triangle is a little anterior to the vertex, and on account of the globosity of the back of the head it is about equally distant from the front and hind margins. The only bristles I can make out on the head are a single pair of reclinate verticals, rather far apart, standing close to the black stripe of the stalk which continues almost to the neck; and the remains of a small pair of postverticals, which are in such poor condition that I can not tell whether they are convergent or divergent. Front long, sloping obliquely, bare; lunula covered, face very receding, margin of mouth slightly prominent. Oral cavity rather large; proboscis and palpi not distinctly visible; third antennal joint rounded at tip, about one and a half times the second; arista with distinct, erect plumosity to the tip. Eyestalks with smallest diameter a little before the middle, gradually enlarging beyond; they have a few small hairs near base which increase in number until they are quite noticeable just before the eye. There is also some yellow hair all the way around the neck.

The thorax is not in very good condition to describe the chaetotaxy as it is considerably denuded and a little soiled. There are no acrostical bristles and no dorsocentrals, unless perhaps one pair close to the scutellum. The calypters are very minute, almost absent. The first abdominal segment is longer than the two following; the second to fourth are almost of the same length, while the fifth is as long as the two preceding. The only bristles I can make out are a row of about six small ones on the hind edge of the fifth segment, and two above and two below, near the tip of the sixth segment or ovipositor; this segment is conical, not flattened, and covered with dark hair, like the ones preceding it.

The legs are slender, none of the femora thickened or spinose; middle tibia with one large and two or three small bristles on the under side at tip, none on front and hind tibia.

Wing as figured by Westwood, the anal cell drawn out in a short point; the auxiliary vein joining the costa almost at a right angle, and the humeral cross vein oblique; the posterior cross vein is near the

tip of the wing, separated by its own length from the anterior cross vein. The stigma is long and reddish brown in color, the rest of the wing being yellow and shining without any brown pattern whatever.

The whole form of the insect is much more slender than that of *Achias.*

Length, 16 mm., without eyestalks.

Redescribed from a single female collected near Chengtu, Szechuen Province, China, by Rev. D. C. Graham. The locality is decidedly palaearctic, but contains, of course, some East Indian elements.

Family ANTHOMYIIDAE

Genus HYDROTAEA Robineau-Desvoidy

Hydrotaea ROBINEAU-DESVOIDY, Myodaires, 1830, p. 509.—STEIN, Verh. Zool.-Bot. Ges. Wien, 1903, pp. 285-337.—GRIMSHAW, Ent. Mo. Mag., sec. ser., vol. 16, 1905, pp. 239-246; vol. 17, 1906, pp. 8-11 and 72-77.—MALLOCH, Bull. Brooklyn Ent. Soc., vol. 11, 1916, p. 109; vol. 13, 1918, p. 30.

HYDROTAEA DISSIMILIS, new species

Male.—Eyes bare; front black, narrower than ocellar triangle; parafrontals on their lower third widening and silvery, linear above; parafacials silvery, narrow; antennae and palpi black, a silver dot in lunule; cheek narrow, hardly one-tenth the eye height.

Thorax black, with faint brownish pruinosity. Anterior acrostichal with two outer rows larger; between are minute hairs in two irregular rows. Intraalar bristles 2. Halteres yellow; calypters ivory-white with yellowish rim and fringe, the hind calypter rounded, not very strongly projecting beyond front one; no hairs on the sclerite anterior to the posterior thoracic spiracle.

Abdomen black, dorsum rather densely covered with pollen; that of the first segment is brown; the second and third have a large triangle of brown with its apex at front edge, its base stretching nearly the whole width of the hind edge; remainder of dorsum of second and third segments and whole dorsum of fourth subsilvery pollinose.

Legs a little slender; front femur with the usual thorns below; middle tibia with several irregular rows of long hairs on the flexor side from before the middle, which spread broadly to the front and hind sides. Hind tibia with a dense row of long, bristly cilia on outer hind side, longest near base; on the inner side it has, except at base and tip, another row of very sloping long hairs.

Wing subhyaline, fourth vein straight, third bent a little back at tip, ending in exact apex.

Female.—Front 0.34 of head width near vertex; ocellar triangle entirely shining, short and wide; parafrontals anteriorly becoming wide and polished black, which continues down to about the level of

the tip of the second antennal joint. Beyond this the parafacial is silvery, becoming more gray below, and this color covers the cheek and back of head. Thorax as in male. Abdomen black, covered with thin, dull-gray pollen. Legs plain, mid tibia without a bristle on outer front side.

Length, of male 4 mm., female 3.2 mm.

Described from one male (type) and one female (allotype) reared from a dead cat at Upland, California, by J. F. Illingworth; both specimens emerged May 25.

Type.—Cat. No. 28881, U.S.N.M.

The broad shining space between eye and root of antennae in the female is very unlike the silvery narrow corresponding part in the male.

HYDROTAEA ABDOMINALIS, new species

Male.—Eyes bare, front very narrow, composed for some distance of the linear parafrontals only; no frontals in and above the narrowest part; parafacials of moderate width and subsilvery pollinose above, more gray below. Cheek about one-eighth the eye height. Palpi and antennae black.

Thorax subshining black with very thin brown pollen. Hairs of mesonotum erect and long. Anterior acrostichal tall and slender, in about four rows but irregular; sternopleura with numerous long hairs besides the bristles; no hairs on the sclerite anterior to metathoracic spiracle. Halteres with black knob. Calypters pale, with yellowish rim and fringe.

Abdomen rather flat above, densely covered with pollen of a pale-bluish color; a black median line is distinct.

Legs black. Front femora and the usual thorns directed forward; a row of setae extends toward the base from each thorn; outer flexor side of tibia with long hairs. The front femur has some long, truncate bristles close to base. Middle femur with several scattered truncate bristles in two rows below on basal half or more, and with several long bristles on upper front side, also on the basal half. Middle tibia with row of erect small hairs on front side, much as in *dentipes* Fabricius; without a bristle on outer front side, but with two on the outer hind side. Hind femur without truncate bristles, but with complete rows of long ones on upper front, lower front, and lower hind sides. Hind tibia with long delicate flexor hairs beginning a little beyond base, and with much longer scattered hairs or bristles in a row each side of the flexor surface, the rows being just about equal. Claws and pulvilli short.

Wings subhyaline, narrow apically, costa reddish beyond the auxiliary for some distance.

Length, 4 and 4.4 mm.

Described from two males. The type was taken at Kaslo, British Columbia, June 11, by Dyar and Caudell; the paratype was collected at Riverside, Yellowstone Park, August 4, 1918, by Prof. A. L. Melander.

Type.—Cat. No. 28882, U.S.N.M.

Genus MESEMBRINA Meigen

Mesembrina MEIGN, Systemat. Beschreib., vol. 5, 1826, p. 10.
Hypodermodes TOWNSEND, Proc. Ent. Soc. Wash., vol. 14, 1912, p. 46.—SEGUY, Anthomyides de France, 1923, p. 363.

MESEMBRINA TRISTIS, new species

Resembles *mystacea*, but the pile of the thorax is black and less dense, and the pale pile of the abdomen begins gradually near the base.

Female.—Front broad (measuring 0.36, 0.37, 0.37 of head width in the three specimens). Head black, only palpi and second antennal joint reddish yellow. Pollen of face brown; back of head and vertex with only black hair.

Thorax and scutellum shining black, with dense erect black pile, longer and denser on and just before the scutellum. Chaetotaxy of disk of mesonotum delicate, hardly distinct from the pile. Calypters blackish. Abdomen shining black, with black pile at base about to hind edge of first segment; thence to apex with light yellow pile, becoming much longer toward apex and extending to venter in that region.

Legs black. Wings clouded along the veins. Venation as in *mystacea.*

Length, 14 to 15 mm.

Described from three females collected by D. C. Graham in the mountains of Szechuen Province, China. Two, including the type, were collected in Yellow Dragon Gorge near Songpan, altitude 12,000–14,000 feet; the other near Tatsienlu, 13,000–14,500 feet.

Type.—Cat. No. 28901, U.S.N.M.

This species would belong to *Hypodermodes* Townsend if that were valid. I can see, however, no sufficient characters to justify its separation from *Mesembrina.*

Family CALLIPHORIDAE

Genus METALLEA Van der Wulp

Metallea VAN DER WULP, Tijdsch. v. Ent., vol. 33, 1880, p. 174.—TOWNSEND, Records Ind. Mus., vol. 13, 1917, pt. 4, p. 193.—SENIOR-WHITE, Records Ind. Mus., vol, 27, 1925, pt. 2, p. 90.

METALLEA ILLINGWORTHI, new species

Male.—Front very narrow, the eyes separated by only twice the width of the front ocellus; frontal bristles beginning below the narrowest place and scarcely reaching to the antennae. The whole head

except the back is yellow in ground color, overlaid on the parafrontal and parafacial by silvery shining pollen which becomes duller on the cheek; parafacial with a few minute delicate pale hairs difficult to see. Antennae red, third joint about twice the second, arista bare, red at base; vibrissae almost the entire length of the third joint above the oral margin which projects strongly forward below them. Hairs of the cheek wholly white except a single row of bristles along the margin of the mouth and extending up to the vibrissae. These bristles do not extend back around the posterior edge of the mouth. Palpi yellow, proboscis black.

Thorax metallic green, heavily overlaid with white pollen which on the dorsum is interspersed with very conspicuous dots where the hairs and bristles originate. The metallic ground color shows dark on pleurae and dorsum as well as the metanotum. The hair of the pleura is almost entirely white, the bristles, however, black. Prosternum with very conspicuous tuft of white hair. Acrostichal 2, 4 (none immediatly before suture); dorsocentral 2, 4; humeral 3; posthumeral 2; presutural 2; supraalar 3; intraalar 4; postalar 2; scutellum with two lateral and one large apical, the discal pair indistinct; sternopleural 1, 1; pteropleural short. Calypters almost pure white, the hind one slightly yellow in the middle. Abdomen short, broad, and rounded, yellow in ground color except on the median line and the posterior edge of the third and a large part of the fourth segments. First segment without median marginals; the second only with depressed hairs along the hind margin; the third with small bristles also depressed along the hind margin; the fourth without discals, but a row of erect marginals. Genital segments black, the two side pieces of the fifth sternite bearing a dense brush of short spines on each side of the cleft which become more scattered and longer toward the tips of the lobes.

Legs black, the coxae and front femora with metallic green reflection; all the knees, tibiae except apices, and basal part of first tarsal segments, yellow or brownish yellow. Claws and pulvilli but little elongated. Middle femur with a row of bristles on the basal half of the lower posterior edge. Hind femur with a row on the lower anterior and on the basal half of the lower posterior. Middle tibia with one bristle on outer front side; hind tibia with three bristles on the outer and three on the inner extensor side.

Wing subhyaline; fourth vein with rounded oblique bend, at its tip becoming almost parallel with the third, ending only a little before the apex. Third vein with only two or three minute setules at base; stem vein distinctly ciliated, as in all this tribe.

Female.—With the front at vertex 0.27 (average of three specimens 0.24, 0.28, 0.28); one upper frontal is reclinate, the remainder decussate; pollen of front and face more yellowish than in the male.

Abdomen mostly black in ground color, only the first segment conspicuous yellow above and below; the remaining segments are covered with gray pollen which bears numerous large and striking dark spots out of which the hairs arise; third and fourth segments more convergent than in the male, the latter with a discal row of bristles. In the female the parafacial hairs are sometimes dark colored and then appear quite distinct.

Length, male 6.5 mm., female from 6–8 mm.

Described from seven males and five females; three males (including type) and four females (including allotype) collected at Cairns, North Queensland, Australia, in 1918 to 1920, by Dr. J. F. Illingworth and A. P. Dodd; one male was collected at Gordonvale, North Queensland, January, 1920; two males and one female collected by Edmund Jarvis from "scrub" in the same general region of North Queensland.

Type.—Cat. No. 28883, U.S.N.M.

As compared with *Metallea notata* Van der Wulp, type of the genus, which is identified by Townsend in the National Museum from India and Java, the new species is larger, the whole upper surface is much more sprinkled with dots, and the characteristic deep black spots on the lateral ventral part of the second and third abdominal segments are lacking. The genitalia are also quite distinct and the lobes of the fifth sternite in *notata* do not possess the brushes of spines. The single female of *notata* in the collection has a subshining translucent region in the lower face including the tranverse impression and the anterior portion of the cheek to a line extending from its lower anterior angle to the lower curve of the eye (this is the Java specimen).

Mr. Malloch informs me that he has identified this species in some of his recent work, not at present published, as *Metallea gracilipalpis* Macquart (described as *Rhynchomyia gracilipalpis*[1] I hesitate to admit this identification because Macquart's specimen was considerably smaller, with wholly yellow abdomen, palpi which to him appeared to be remarkably slender and were so figured, and with, according to his figure, quite an unusual row of vibrissae.

METALLEA ROBUSTA, new species

Male.—The front at narrowest twice the width of the ocellar triangle; parafacials not quite twice as wide as the front, with numerous coarse but short black hairs. Antennae brownish red, the penultimate joint longer than in the related species, twice as long as wide. Cheek with pale yellow hair, very conspicuous on the hind portion and a brown spot on the anterior upper part. Thorax about the same as in *nigribarba*, the dorsum being decidedly coppery, the pleural hairs, however, being almost entirely pale as in *illingworthi*.

[1] Dipt. Exot., Suppl. 5, p. 129 (sep. p. 109), pl. 6, fig. 3

Abdomen mostly yellow in ground color with a median black stripe, the fourth segment metallic with a coppery reflection and bearing two irregular discal rows of bristles besides the marginals. Fifth sternite with a few spines at the base of the lobes, but apparently not so many as in the preceding species. Legs as in *illingworthi*, but femora rather stouter and the tibia very slightly infuscated at tip. Calypters with a distinctly yellowish cast.

Length, 9.3 mm.

Described from one male, Geraldton, Western Australia (Clarke, 1916), received from Mr. W. W. Froggatt, of Sidney, New South Wales.

Type.—Cat. No. 28885, U.S.N.M.

METALLEA NIGRIBARBA, new species

Male.—Head as in *illingworthi*, but the ground color is more brownish yellow, the parafacials a little wider, more shining and with a few dark hairs, and the cheek is clothed with brown hairs in its whole width from the lower edge of the eye to the border of the mouth. Dorsum of thorax much more coppery and with thinner pollen, the hairs longer and more erect. The hair of pleurae black. Both calypters distinctly infuscated.

Abdomen with bluer median black ground color, expanding on the hind margins of segments 2 and 3 and showing a slight green tinge; fourth segment with scattered, erect, bristly hairs from very distinct spots; fifth sternite with brushes on the lobes as in the preceding. Tibia yellow, not infuscated at tip; tarsi almost black, not much lighter on the basal segment.

Length, 7 to 7.4 mm.

Described from three males collected at Seaford, Victoria, Australia, by W. F. Hill. One of the specimens is returned to Gerald F. Hill, of Melbourne, Australia. The specimens are accompanied by two puparia, which it is expected will be figured by Charles T. Greene in a later publication.

Type.—Cat. No. 28884, U.S.N.M.

Family SARCOPHAGIDAE

Genus WOHLFAHRTIA Brauer and Bergenstamm

Wohlfahrtia BRAUER and BERGENSTAMM, Zweifl. Kais. Museum Wien, pt. 4, 1889, p. 123; pt. 6, 1893, p. 165.

WOHLFAHRTIA ATRA, new species

Like *meigenii*, but the abdomen wholly shining black.

Male.—Front 0.31 of head width (in the best specimen), with rather plumbeous thin pollen; parafacials silvery with delicate hairs above; antennae reddish at base, arista bare. Palpi dark yellow.

Thorax with thin plumbeous pollen, no acrostichals except the prescutellar pair.

Abdomen wholly shining black; no median marginals on second segment. Genitalia black, structure almost exactly as in *meigenii*.

Legs black, front femora with gray pollen on outer side; all the tibiae with villosity, less on front ones, that on middle ones forming a tuft at tip; hind femora and tibiae curved.

Wings hyaline, third vein hairy less than halfway to cross vein.

Length, 13.5 mm.

Described from two males collected by D. C. Graham in Yellow Dragon Gorge, near Songpan, Szechuen Province, China, altitude 12,000–14,000 feet. This is a region strictly palaearctic in fauna.

Type.—Cat. No. 28902, U.S.N.M.

Family TACHINIDAE

Genus XIPHOMYIA Townsend

Xiphomyia TOWNSEND, Insecutor Inscitiae Menstruus, vol. 4, 1916, p. 125.

The type species of this genus, *gladiatrix* Townsend, was described in the same place as the genus and is from Panama. Reinhard has described a second species, *texana*,[2] from College Station, Texas.

Females of this genus have a very long, slender, curved piercer, too long to be concealed in an abdominal groove. In the type of *gladiatrix* the tip of the piercer reaches to the middle coxae. The males are much like those of *Eucelatoria*, but the parafacials in the latter are bristly about halfway, while in *Xiphomyia* there are only a few fine hairs above the vibrissae.

XIPHOMYIA AURICEPS, new species

Male.—Front 0.24 of head width at narrowest point; parafrontals and parafacials, middle of face, upper part of bucca, and posterior orbits, golden pollinose; one pair verticals, a very small pair of ocellars, frontals 9, the uppermost one large and reclinate, lowest one at level of base of third antennal joint, not close to eye. Bucca one-fifth the eye height. Palpi yellow. Antennae black, third joint three times the second, reaching almost to vibrissae; arista slender from the base; penultimate joint short.

Thorax black with yellowish-gray pollen, denser and more distinctly yellow from the humerus to the base of the wing. Pleurae gray pollinose; sternopleural bristles 2, 1; scutellum black at base, yellowish pollinose toward apex with two large divergent apical bristles, no small ones between. Calypters slightly infuscated.

Abdomen black, subshining, the second, third, and fourth segments broadly gray pollinose on basal half or more. This pollen has only a slight tinge of yellow. First segment with two pairs median mar-

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[2] Entomological News, vol. 34, 1923, p. 267.

ginals; second with one pair discal and one median marginal; third segment with one pair discal and a marginal row of about 10; fourth segment with a single discal pair as in the two preceding segments, and a marginal row of about 12. Genitalia black, small, the inner forceps distinctly separate, quite minute; the outer a little longer and wider.

Legs black, pulvilli large; middle tibia with a single bristle on the outer front side; hind tibia with an irregular row on outer hind side.

Wings subhyaline, third vein with two or three hairs at base; fourth vein near apex with oblique rounded curve, thence nearly straight, ending somewhat before the tip of the wing.

Female.—Front 0.24 of the head width at vertex, widening a little more rapidly than in the male. The usual two pairs of orbital bristles present. Pulvilli of ordinary size for a female. The piercer is shining black, slender, curved and tapering, its tip just about reaching the hind coxae.

Length, 7 mm.

Described from one male (type) and one female (allotype) collected September 2 and 3, 1923, on the Shenandoah River, Clarke County, Virginia, by the writer.

Type—Cat. No. 28900, U.S.N.M.

SYNORIS, new genus

Distinguished from most Tachinid genera at a glance by the presence of only one pair of anterior acrostichals, which are large and placed considerably anterior to the suture in a transverse line, or nearly so, with the hindmost pair of anterior dorsocentrals. Postscutellum well developed; head rather flat, its length to the antennae when measured by micrometer is exactly half the greatest width when viewed from in front; the length at lower edge but little less than at antennae. Eyes bare; frontal bristles extending to arista, or thereabouts; parafacials and facial ridges bare; vibrissae at oral margin; third antennal joint long and slender, second also somewhat elongated, one-half the third; penultimate joint and arista short; palpi normal; proboscis short and fleshy.

Thoracic chaetotaxy of type species: Acrostichal 1, 2 (none just before or behind suture); dorsocentral 2, 3; humeral 2; posthumeral 1; presutural 1; notopleural 2; supraalar 2; intraalar 3; postalar 2; sternopleural 2, 1; pteropleural very small; scutellum with two lateral, one long apical pair (with or without small pair between them) and a good-sized discal pair.

Abdomen with discal bristles. Venation of wings bare, except two or three hairs at base of third; first posterior cell narrowly open or almost closed only a little before the apex of the wing; no costal spine.

Type of genus.—Synoris coquilletti, new species.

SYNORIS COQUILLETTI, new species

Hypostena pedestris WALKER of Coquillett, Revision N. A. Tachinidae, 1897, p. 61.

Male.—Front at narrowest measuring 0.21, 0.24, 0.25, and 0.25 of the head width in the four specimens. Parafrontals with gray pollen becoming more white on the parafacial which is narrower than third antennal joint; cheek one-third the eye height; ocellar bristles small, proclinate; frontal stripe reddish brown; frontal bristles 8 or 9, the two uppermost reclinate, the second largest. Antennae yellow to the arista, the third joint infuscated for the remainder of its length except underneath near the base. Palpi and proboscis yellow. Mesonoumt with dense gray pollen with faint stripes. Scutellum broadly yellow at tip. Pleurae partly yellow in ground color; calypters with a white margin, the disk slightly infuscated.

Abdomen decidedly pointed with more or less of reddish-brown color at the sides near the base; the pollen is very uniformly placed, covering the whole abdomen except a little on the venter. The abdominal hairs are mostly placed on small bare spots. First segment with a pair of median marginals, one large marginal at the side and several smaller bristles before the latter; second segment with one discal and one median marginal pair, at the side with one discal and one marginal; third segment with one discal and a marginal row of 10 as well as one conspicuous discal at the side; fourth segment with discal and marginal bristles irregularly arranged, about 18 in all. Venter yellow in ground color. Genitalia small, yellow, retracted.

Legs entirely yellow, the tarsi on account of numerous black hairs appearing more brown; claws and pulvilli elongated; middle tibia with one bristle on outer front side and a much smaller one close above it; hind tibia with an irregular row on the outer side in the middle of which is one longer bristle, on the inner hind side a large bristle, and a smaller halfway between this and the base.

Wings grayish hyaline, the fourth vein with an oblique curve at the bend, thence nearly straight to the tip.

Length, 7 to 8.2 mm.

Described from four males, three of which, including the type, were collected by D. W. Coquillett in Los Angeles County, California, the other collected by Prof. T. D. A. Cockerell at Beulah, New Mexico, July 15. The last specimen is the largest and has the narrowest front. It also has a broader yellow spot on each side of the abdomen.

Type.—Cat. No. 28910, U.S.N.M.

According to the notes of Major Austen,[3] Walker's *Dexia pedestris* is an entirely different species, having the parafacials hairy, and evidently belongs to the genus *Cryptomeigenia*.

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[3] Annals and Magazine of Natural History, vol. 19, 1907, p. 345.

As a synonym of his *pedestris*, Coquillett included *Masicera eucerata* Bigot, but Brauer reported[4] on this, and from his data it evidently belongs to the genus *Sipholeskia.*

URSOPHYTO, new genus

Similar to *Arctophyto*, but with parafacials hairy. Head somewhat globose, strongly developed below; bucca two-thirds the eye height; parafacial two-thirds as wide as bucca; antennae small, third joint much less than twice the second; arista pubescent; facial keel narrow, reaching a little below the antennae. Vibrissae just above oral margin, not large, a few small hairs on facial ridges above them. Palpi normal; proboscis short. Thoracic chaetotaxy: Acrostichal 2, 3; dorsocentral 4, 4; humeral 5; posthumeral 3; presutural 1; notopleural 2; supraalar 4; intraalar 3 (none near suture); postalar 2; scutellum with two or three pairs of marginals, a somewhat smaller pair of decussate apicals and an irregular row of about four pairs of submarginals; sternopleurals in male 0–2 anterior, 1 posterior; in the single female 3 anterior, 1 posterior.

Abdomen with no discal macrochaetae, even on the fourth segment; second segment usually with one pair median marginals; third with a marginal row of 8 or 10; fourth with a marginal row of 10 or 12.

Type of genus.—*Ursophyto rufigena*, new species

URSOPHYTO RUFIGENA, new species

Male.—Front 0.18 of the head width (average of three, 0.17, 0.19, 0.19), widening rapidly. Front somewhat inflated, the brown median stripe wide toward the antennae; frontal bristles beginning a little before the ocellar triangle, close together in the row, about 13 in all, reaching barely to the base of the antennae; parafacials reddish in ground color, almost destitute of pollen. Palpi yellow.

Thorax black, lightly and rather evenly pollinose, but showing some indications of stripes. Scutellum and postscutellum of the same color. Pleurae reddish brown; the hairs of the mesonotum are erect and rather dense, but do not hide the pollen.

Abdomen black in ground color with a considerably reddish tinge, the pollen covering the whole surface, but in some directions not showing distinctly. A median pollinose line is peculiarly changeable, sometimes lighter and sometimes darker than the adjacent portion. Genitalia very small, brownish; the inner forceps very small, slender, close together; the outer forceps in the form of large plates, as is usual in Dexiids.

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[4] Sitzungsber. Kais. Akad. Wien, vol. 106, 1895, p. 12.

Wings subhyaline, bend of fourth vein slightly angular, the tip of the vein a moderate distance before the apex of the wing; third vein with three or four small hairs at base.

Legs black, slender, but not elongate; the claws and pulvilli small; middle tibia with one or two bristles on the outer front side; hind tibia with short and rather appressed ciliation on outer hind side.

Female.—Front 0.33 of the head width. Antennae considerably larger than in the male. Middle tibia with an even row of five bristles on the outer front side.

Length, male 11 mm., female 12 mm.

Described from five males and one female; three males, including the type, were collected at Friday Harbor, Washington, by the writer on July 6 and 17, 1905; one male from the California Academy of Sciences, was collected by E. C. Van Dyke in Paradise Valley, Mount Rainier, Washington, July 25, 1920; one male, Eberts, B. C., June 19, 1914 (B. H. Chrystal, in Canadian National Collection); the female (allotype) was collected at Hood River, Oregon, by LeRoy Childs on August 1, 1917.

Type.—Cat. No. 28899, U.S.N.M.

This species appears to vary remarkably in the number of the bristles on the outer front side of the middle tibia as well as in the anterior bristles of the sternopleura. One male has none of the latter, while the female has a group of three. The specimen from Mount Rainier has a more dense pollen on the abdomen and the bristles on the second segment are depressed.

MELEDONUS, new genus

Similar to *Phytopsis*, but has greatly reduced palpi and a somewhat longer and thinner proboscis. Head in side view somewhat square, bulging behind the eye and projecting far before it, the face descending almost vertically. Palpi about as long as the third joint of the front tarsus, slightly swollen and entirely bare. Proboscis when folded up projecting forward out of the mouth cavity by the length of the labella.

Front rather wide in both sexes; the male without orbitals. A single, large, reclinate vertical on each side. The frontals about seven in number, hardly descending below base of the antennae and not at all diverging toward the eye; the uppermost frontal and the ocellar are turned almost exactly toward the side. Parafacials with small but distinct scattered hairs. Eyes bare. Thoracic chaetotaxy: Acrostichal 0, 1; dorsocentral 3, 3; humeral 2; posthumeral 1; presutural 1; notopleural 2; supraalar 3; intraalar 2; postalar 2; scutellum with two lateral and a smaller decussate apical pair, no discals;

sternopleurals 2, 1. Wing with an oblique bend in the fourth vein, which ends moderately far before the apex; the auxiliary and first longitudinal veins end rather close together in the costa. Veins bare except the base of third.

Type of genus.—*Meledonus latipennis*, new species.

MELEDONUS LATIPENNIS, new species

Male.—Front 0.35 of head width, entirely black, the median stripe four times as wide as one orbit when measured just in front of the ocellar triangle. Parafrontals widening downward, with gray pollen which continues on the parafacials and around the bucca. Antennae black, third joint only a little longer than second; the arista strikingly short, basal joints short; vibrissae not much above the oral margin, the angles not convergent; back of head with entirely black hair.

Thorax with thin grayish pollen, subshining in the middle; scutellum of same color; calypters white.

Abdomen rather elongated, the first three segments with uniform whitish pollen except on apical edge, which shows best when viewed from behind; fourth segment entirely shining black; the first and second segments each have a pair of median marginals, the third segment with a row of about 14; the last segment has only a marginal row of about the same number. Legs entirely black, pulvilli distinctly elongated, middle tibia with two bristles on outer front side.

Wings uniformly infuscated with the veins yellow, at base becoming brown. Base of third vein with about four large erect hairs rather far apart.

Female.—Front 0.40 of the head width (average of three, 0.37, 0.41, 0.42).

Wings considerably broader than in the male.

Length, 5.5 to 6.3 mm.

Described from one male and three females; two females are from southern Sonoma County, California, July 1, 1910, and May 23, 1911, collected by J. A. Kusche; the male was collected at San Francisco, California, June 11, 1910, by the same collector. Another female was collected at Stone Canyon, Monterey County, April 27, 1919, by E. P. Van Duzee.

Type male and allotype female (from Sonoma County) are in the collection of the California Academy of Sciences.

Paratypes.—Two females, Cat. No. 28901, U.S.N.M.

Genus LIXOPHAGA Townsend

Lixophaga Townsend, Taxonomy Muscoid Flies, 1908, p. 86; Journ. N. Y. Ent. Soc., vol. 21, 1913, p. 303.—Aldrich, Insecutor Menst., vol. 12, 1924, p. 146; Proc. Ent. Soc. Wash., vol. 27, 1925, p. 133.

LIXOPHAGA ORBITALIS, new species

Male.—Front 0.345 of head width (average of two, 0.34 and 0.35), its pollen with a slight yellowish tinge on the upper half; two orbitals on each side; frontals seven, the upper two reclinate, the second largest, lowest at level of tip of second antennal joint; parafacial silvery, three-fourths as wide as third antennal joint, bare; face receding, the ridges with only a few fine hairs above vibrissae; antennae black, third joint five to six times as long as second, rather wide; arista with short basal joints; palpi yellow, bucca about one-fourth the eye height.

Thorax cinerous, showing when viewed from behind four black stripes to the suture and five behind it, the median one not extending before the suture. Chaetotaxy: Dorsocentral 3, 3; acrostichal 3, 3; humeral 3; posthumeral 2; presutural 2 (inner small); notopleural 2; supraalar 3; intraalar 3; postalar 2; sternopleural 2, 1; scutellum with 3 lateral, 1 discal, 1 small upturned decussate apical.

Abdomen with black ground color, tinged with reddish at sides; first segment black, the three following with dense pale yellowish pollen on basal three-fourths, the remainder black. The black on the second segment is more or less expanded forward on each side, and there is a narrow median dark stripe which shows on the second and third segments. First and second segments with one pair median marginals; third with a stout marginal row of 8; fourth with smaller marginal row of 8 or 10; no discals on any segment. Genital segments black or brown, very inconspicuous, the genitalia like those of *variabilis* in having the inner and outer forceps slender, long, nearly parallel; the inner are a trifle the shorter and sharp at tip; the outer rounded.

Legs black; mid tibia with one on outer front, one flexor, two behind. Hind tibia with irregular row on outer hind side. Pulvilli very small.

Wings hyaline; first posterior cell open, ending just before extreme tip of wing; third vein with 2–3 hairs at base.

Female.—Front 0.355 of head width at vertex (average of two, 0.36 and 0.35) widening anteriorly; antenna slightly shorter than in male. Without piercer. One of the two has four posterior dorsocentrals, but not evenly spaced.

Length, 4.2 to 5.6 mm.

Described from four males and two females, all reared from larvae of *Carpocapsa pomonella*, the codling moth, in three lots.

The oldest lot consists of a single male, Sonoma County, California (Koebele, 1891). This is the specimen mentioned by Coquillett in his host index [5] as *Hypostena variabilis*, and by Townsend as *Euzenillia*, species, [6] and referred to by me as a new species. [7]

The second lot consists of a single female from Agnew, California, bred by J. F. Laminan; emerged June 1, 1923. This specimen was included under *variabilis* by me,[7] but I now believe it should go here.

The third lot consists of three males (including type) and one female (allotype) reared in 1925 at Saticoy, California, by S. E. Flanders. They came from the first brood of the codling moth.

Type.—Cat. No. 28904, U.S.N.M.

The males of this species are easily distinguished from those of *variabilis* by two characters—the presence of orbital bristles and the very minute size of the pulvilli. *Variabilis* has large pulvilli and no orbitals, and its front in the male is from 0.21 to 0.28 of the head width (five measured gave 0.21, 0.24, 0.25, 0.27, 0.28). The females are very hard to separate from *variabilis*, but seem to have a wider front, as in five females of the latter the front measured 0.30, 0.31, 0.32, 0.33, 0.33 of the head width, averaging 0.32.

LIXOPHAGA JENNEI, new species

Male.—Front 0.31 and 0.34 of the head width in the two specimens, with bristles as in other members of the genus. Parafacials narrow, about one-fourth the width of the third antennal joint; palpi yellow; antennae black, elongate, reaching the vibrissae; the third joint broader than in related species. Arista dark red at base for a considerable distance. Thorax, viewed from behind, with the usual four black stripes, the two inner narrower. Posterior dorsocentral 3; sternopleural 3; 1 pteropleural about as large as the smallest sternopleural; scutellum with three lateral and a minute upturned pair of apicals which in one specimen are a little above the usual position. The scutellum also has one pair of small discals beyond the middle. Abdomen with interrupted pollinose cross bands on the second and third segments which fade out posteriorly at about the middle, leaving the remainder shining black; the fourth segment has a denser and better defined cross band, very narrowly or not at all interrupted, covering more than one-half its length. All of these cross bands extend upon the venter. First segment with one pair median marginals, the second the same, third with marginal row of eight; fourth

[5] Revision 1897, p. 17.

[6] Insecutor Inscitiae Menstruus, vol. 4, 1916, p. 31.

[7] Proc. Ent. Soc., Wash., vol. 27, 1925, p. 134.

segment with a marginal row of about eight bristles and two or three feeble discal bristles which are not represented on the preceeding segments. Wing hyaline, third vein with two or three bristles at base; bend of fourth vein rounded and oblique; first posterior cell distinctly closed in the margin in one specimen, in the other barely closed, in both cases ending just before the exact tip of the wing. Legs black; pulvilli not enlarged.

Length, 3.3 and 3.6 mm.

Described from two males reared by Eldred L. Jenne at Siloam Springs, Arkansas, on July 5 and 15, 1907 (Quaintance Nos. 4010 and 4011). The host is *Carpocapsa pomonella* Linnaeus, the codling moth.

Type.—Cat. No. 28905, U.S.N.M.

Named in honor of E. L. Jenne, whose early death was a loss to entomology.

In my key to *Lixophaga* this species would run to *mediocris*, from which it differs in having narrower parafacials, wider third antennal joint, more pollinose abdomen, and first posterior cell closed in the margin of the wing. It has a less protuberant front than *variabilis* and *orbitalis*.

Genus PETEINA

Peteina MEIGEN, Syst. Beschr., vol. 7, 1838, p. 214.—BRAUER and BERGENSTAMM, Zweifl. Kais. Mus., pt. 4, 1889, p. 138; pt. 5, 1891, p. 387.

PETEINA HYPERDISCALIS, new species

Male and female.—Differs from the European *erinaceus* Fabricius, the type of the genus, in having very large discal bristles on the first, second, and third abdominal segments, which are larger than the marginals just behind them; this is especially remarkable on the first segment, where discals of any size are almost if not quite unknown. In this genus the apparent first segment is elongated, equal to the fourth and longer than the second or third. While *erinaceus* is said to have no discals, the marginals at the middle are set considerably forward of those at the sides in the single European specimen (determined by Bezzi) in the National Museum. The new species has the abdominal hair more erect and almost bristly.

Elongate, shining black, all parts very bristly, the thorax with only the thinnest white or bluish-white pruinosity. Head with thin bluish-white pollen, bulging behind, front prominent, bristles long and stout, a row on parafacial reaching nearly as far down as vibrissae. Palpi black. Eyes bare. Antennae black, second joint three-fourths as long as third. Male with large proclinate orbitals. Anterior acrostichals wanting. Third vein setulose far beyond cross vein. First posterior cell open far before wing tip. No pteropleural.

Length, 8.5 to 9 mm.

Described from three males (including type) and one female (allotype) collected on July 13–18, 1923, by D. C. Graham, west of Chetu Pass, near Tatsienlu, Szechuen Province, China; altitude over 13,000 feet.

Type.—Male, Cat. No. 28898, U.S.N.M.

MICROSILLUS, new genus

Type of genus.—*Houghia baccharis* Reinhard.[8]

The genus is related to *Siphosturmia* Townsend, from which it differs in having the first vein setulose near the base, the second antennal joint much shorter than the third, and the vibrissae considerably nearer the lower margin of the head. It differs from *Houghia,* to which it would run in Coquillett's and Adams's keys, in having the face flat and somewhat projecting below, while in *Houghia setipennis* it is very deeply excavated and strongly receding; also the proboscis in *Houghia* is very short. The female shows the same conical, pointed, red fourth abdominal segment as in *Siphosturmia:* the other structural characters are also substantially the same, including the form of the proboscis which is slender but not much elongated.

The palpi are normal; vertical bristles two pairs; ocellars well developed and proclinate; two upper frontals reclinate, stout but not very long; two large proclinate orbitals; four sternopleurals; about three stout bristles on the outer front side of middle tibia.

The single type specimen, now in the National Museum, was collected at College Station, Texas.

A second species, very closely related to *setipennis*, is *Siphosturmia pollinosa* Townsend.[9] This also has the first vein setulose near the base, although the fact was not mentioned in the original description. It may even be identical with *baccharis,* in which case it will take priority, but the single specimen of *baccharis* seems to differ slightly from the six specimens of *pollinosa* (four types from Somate, Peru; two specimens from Piura, Peru) in the National Museum collection in having the pollen a little whiter or more silvery and that on the abdominal segments a little more defined at the bases, so that in *baccharis* there are very distinct, alternating crossbands of black and white, which to the naked eye are of about equal width. I can see no structural differences, but having only one specimen of *baccharis* I can not judge of the extent of variation which may occur. I therefore consider the two species distinct for the present.

SIMOMA, new genus

Runs to *Erynnia* in Stein's 1924 Key to the European Genera, but is different in having the antennae inserted below middle of eyes, the

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[8] Annals Entomological Society of America, vol. 14, 1921, p. 332, with figs. 5 and 6.

[9] Proc. U. S. National Museum, vol. 43, 1912, p. 321.

entire series of frontal bristles reclinate, and back of head with only white hair behind the single row of orbital cilia.

Eyes bare, front narrow above, ocellars minute, proclinate, frontals extending to tip of second antennal joint; parafacials bare, narrow, frontal ridges with bristles almost meeting lowest frontals. Face only a little receding; vibrissae at edge of mouth. Palpi normal, proboscis small. Antennae slender, second joint more than half the third, which reaches almost to vibrissae; arista slender, bare, basal joints short.

Thoracic chaetotaxy of genotype: Acrostichal, 3, 3; dorsocentral, 2, 3; humeral, 4; posthumeral, 1; presutural, 2; notopleural, 2; supra-alar, 3; intraalar, 3; postalar, 2; sternopleural, 1, 1; scutellum, with three lateral, one irregular and upturned apical.

Abdomen with discals, several pairs large and small, more numerous in male.

Wing with petiolate apical cell, the third vein ending far before tip. Veins bare except a few hairs at base of third.

Type of genus.—Simoma grahami, new species.

SIMOMA GRAHAMI, new species

Male.—Color black throughout, including antennae and palpi. Front narrow, 0.17 of head width (three measured 0.17, 0.17, and 0.18); the frontal stripe black, very narrow near the ocelli. Parafrontals comparatively broad, shining black above, gradually changing to silvery on the parafacials, a single pair of large verticals; the frontal row slightly double in the diverging part below; cheek about one-fourth of eye height, bristly almost to the eye.

Thorax subshining black; viewed from behind the dorsum has enough pruinosity to leave four incomplete black stripes. Scutellum wholly subshining black; postscutellum pollinose. Calypters white, the hind one with a slight and variable infuscation.

Abdomen in some lights almost shining black or with slight bluish metallic tinge, in other directions showing a considerable amount of pollen except on the tips of segments. Several pairs of erect bristles of varying size are present on each of second, third, and fourth segments. Venter entirely shining with a slight metallic tinge. Legs black; pulvilli moderately elongated and distinctly infuscated. Middle tibia with two bristles on outer front side near middle; hind tibia with a rather uniform row of bristles on the outer side, interrupted by one longer just below the middle.

Wing distinctly infuscated, third vein with about three bristles at base; costal spine present but small, last section of fifth vein barely one-third the preceding.

Female.—Front considerably wider than in the male, gradually narrowing to the vertex, where in three specimens it measures 0.22,

0.23, and 0.25 of the head width. Parafrontals each about as wide as the median stripe and distinctly shining black. Pollen developing toward the lower end as in the male; only one pair of vertical bristles developed as in the male. Cheek about one-third the eye height.

Abdomen wholly shining black except a narrow silvery band at base of segments 1 and 2. There are not so many erect discal bristles and hairs as in the male. No trace of a piercing organ is visible.

Length, of male 5.6–6.2 mm., female 4–6.4 mm.

Described from four males (including type) and five females (including allotype) collected at Suifu, Szechuen, China, by Rev. D. C. Graham.

Type.—Cat. No. 28930, U.S.N.M.

EUCOMUS, new genus

A bright green species resembling *Gymnochaeta*, but with numerous long hairs on the parafacials; eyes densely hairy, front narrow in male, prominent below, face concave below, but its lower margin projecting as much as at front. Facial ridges bearing several long hairs above vibrissae, but the uppermost only at level of tips of antennae; third antennal joint only a little longer than the second; penultimate joint of arista short; palpi of usual length, but unusually slender; proboscis slender and a little elongated, but with well-developed labella.

Abdomen with discals. Bend of fourth vein with abrupt curvature but not appendiculate; veins bare except base of third; first posterior cell open considerably before the wing tip.

Type of genus.—*Eucomus strictus*, new species.

EUCOMUS STRICTUS, new species

Male.—Cheeks, back of head, thorax, and abdomen bright green; front very narrow, at narrowest hardly more than twice the width of anterior ocellus; frontal bristles reduced to hairs from this part upward. Postocular cilia long and conspicuous; parafrontals and parafacials with greenish tinge in certain directions, but somewhat overlaid with rather dark pollen; the parafacial wider than the third antennal joint. Antennae black, palpi yellow, rather dark at base. Back of head flat with dense yellow hairs forming a distinct ruff, between which and the eye there is only one row of hairs above, but two or three below. Thoracic chaetotaxy: Acrostichal 3 (posterior damaged); dorsocental 3, 3; humeral 4; posthumeral 2; presutural 1; notopleural 2; supraalar 3 (the middle one large); intraalar 3; postalar 2; sternopleural 2, 1; pteropleural 1 (smaller than sternopleural); scutellum with three lateral pairs, apparently no apical, the discal hairs erect, one pair bristly. Halteres with blackish knob; squamae yellow, the posterior more brown, both with a yellow rim and fringe.

Abdomen brilliant green without any pollen, the bristles erect and numerous, erect bristly hairs between them in the middle region. Genital segments rather small, somewhat greenish, both with numerous erect hairs, which arelargely on the second. Genitalia black, the inner forceps united into a slender shining beak, its tip bent backward but with a very minute hook forward, the outer forceps also slender and about as long as the inner, also with microscopic hook at tip. Fifth sternite rather prominent, the lobes brown, not with any remarkable spines or other stuctures. Legs black, the femora with metallic green reflections, the tibiae more or less yellowish in the middle, especially the hind ones. Middle tibiae with three bristles on outer front side, hind tibiae with irregular cilia mixed with longer bristles on the outer side. All the claws and pulvilli greatly elongated, the latter light brown. Wings uniformly infuscated, third vein with small setules extending about halfway to the cross vein.

Length, 7. 5 mm.

Described from one male collected at Yellow Dragon Gorge, near Songpan, Szechuen, China, in late July, 1924, by Rev. D. C. Graham. The altitude of this gorge is from 12,000 to 14,000 feet, and the region is strikingly palaearctic.

Type.—Cat. No. 28931, U.S.N.M.

PSILONEURA, new genus

Third vein without any bristles at base; first posterior cell ending in the apex, closed or slightly open, back of head with only black hairs. Abdomen broad and rather flat, with numerous erect bristles which occupy the middle of the first and second and the whole of the third and fourth segments and are irregularly arranged. Scutellum with three pairs of marginal bristles of equal size and all equally diverging, besides a lateral basal pair higher up and a discal pair. Front decidedly prominent, face receding, back of head bulging below, cheek fully one-half the eye height; lower edge of head sloping upward to the vibrissae; facial ridges and parafacials bare. Eyes distinctly but not densely hairy; proboscis and palpi normal. Third antennal joint hardly longer than second; penultimate joint of arista short, beadlike; last joint strikingly enlarged at the extreme base. Ocellars proclinate, divergent; frontals in a single row, the uppermost divergent in female, erect in male, the lowest hardly reaching the middle of the second antennal joint.

Type of genus.—*Psiloneura flavisquama,* new species.

PSILONEURA FLAVISQUAMA, new species

Male.—Entirely black, including antennae, palpi, and legs, the wings, however, with venation yellow at base and the squamae and

halteres deep yellow. Front narrow, 0.20 and 0.21 of the head width in two specimens, with cinereous or slightly brownish pollen on the parafrontals extending down around the eye; frontal bristles quite erect. Proboscis retracted, small. Thorax shining black, with very thin subcinereous pollen visible only in certain directions.

Chaetotaxy: Acrostichal 2, 2; dorsocentral 3, 4; humeral 4; post-humeral 1; presutural 1; notopleural 2; supraalar 3; intraalar 3; postalar 2; sternopleural 2, 1 (the lower almost equally separated by the two upper). Scutellum as above. Postscutellum distinctly gray pollinose, somewhat contrasting with the scutellum and metanotum. Abdomen as above. Genitalia black. Legs black; all the claws and pulvilli enlarged, the latter brown. Front tibiae with rather conspicuous flexor row and still larger outer row; middle tibiae with three or four bristles on the outer front side and four or five on the outer hind side, besides one flexor, and one directly on the posterior side; hind tibiae with eight or ten alternating large and small bristles on the outer side, five or six long bristles on the extensor surface. Wings long and rather narrow, slightly infuscated throughout, toward the base more yellow; fourth vein with a rounded bend, slightly concave beyond, closing the first posterior cell in the apex. All the veins bare.

Female.—Front narrow, 0.33 and 0.34 of the head width at apex in the two specimens. Palpi rather brown than black; first posterior cell distinctly open, last section of fifth vein very short, decidedly less than half the cross vein (in the male, full half the cross vein).

Length, male 5.4 mm., female 5.8 mm.

Described from two males (including type) and two females (including allotype) collected at Belding, Michigan, June 3, 1925, by L. G. Gentner, received from H. J. Reinhard.

Type.—Cat. No. 28929, U.S.N.M.

Genus LYPHA Robineau-Desvoidy

Lypha Robineau-Desvoidy, Myodaires, 1830, p. 141.—Aldrich and Webber Proc. U. S. National Museum, vol. 63, art. 17, 1924, p. 10.

LYPHA MACULIPENNIS, new species

Female.—Readily distinct from *Lypha dubia* Fallen in having a large blackish spot covering the small cross vein and the tip of the scutellum broadly reddish. Like *dubia*, it has the eyes densely pilose, the frontal bristles descending below the level of the arista and a single large pteropleural bristle which is nearly as large as the principal supraalar.

Front rather narrow at vertex (0.15 of the head width), widening uniformly as viewed from in front; the bucca one-half the eye height; antennae black, the third joint about twice the second; penultimate

joint of arista about three times as long as thick, the last joint thickened to the middle; the facial ridges with only a few hairs above the vibrissae; palpi yellow.

Thorax black with changeable stripes. In an oblique direction from behind the median stripe is distinctly silvery and ends abruptly at the suture.

Chaetotaxy as in *dubia,* but the bristles more slender, and the scutellum has on its disk one pair of smallish bristles and one pair of slender, erect hairs, besides smaller hairs.

Abdomen subshining with bronze reflections, bases of the segments two, three, and four with broad but changeable pollinose bands. Discal bristles somewhat mixed with large erect hairs on the middle part of segments two, three, and four.

Wings subhyaline, the third vein with from four to seven coarse hairs rather far apart; calypters distinctly infuscated.

Legs black, the front tarsi distinctly broadened on the last four segments. Middle tibia with three long bristles on outer front side; hind tibia with irregular, long bristles on outer hind side.

Length, 6.6 mm.

Described from one female collected at Forks, Clallam County, Washington, July 1, 1920, by E. P. Van Duzee.

Type.—In collection of California Academy of Sciences.

Genus CUPHOCERA Macquart

Cuphocera MACQUART, Annales Soc. Ent. France, 1845, p. 267.

CUPHOCERA AUREA, new species

Male.—Front 0.36 and 0.34 of head width in the two specimens, widening rapidly below, black with plumbeous pollen, a shining black stripe on each side of ocellar triangle; inner verticals long, strong, decussate; outer a little smaller, divergent; frontal bristles about 12 in the row, the upper one largest, reclinate and divaricate, the lower one close to eye at level of middle of second antennal joint; an extra row of three or four frontals outside the lower part of the main row. Ocellars present. Parafacials hairy with one or two stout bristles below, yellow in ground color and golden pollinose, this color beginning just below the frontals and extending on bucca almost to back of head; middle of face also yellow and golden pollinose, its lower border protuberant, its ridges bare except a few hairs next to vibrissae. First and second joints of antennae deep yellow, the third black except at extreme base, strongly convex in front, longer than second joint; arista black, short, evenly tapering, penultimate joint long. Palpi very minute, hardly visible but bearing a few distinct hairs. Proboscis black, short.

Thorax with plumbeous pollen and when viewed from behind with four shining black stripes. Chaetotaxy: Acrostichal 2 or 3, 3 (none or a small just before suture); dorsocentral 3, 4; humeral 5; post-humeral 2; presutural 2; notopleural 2; supraalar 3; intraalar 3; postalar 2; sternopleural 2, 1; scutellum with two marginal and a rather long decussate apical pair, disk with several erect spiny bristles of smaller size.

Abdomen subshining black, with thin rather silvery pollen, a sharply marked reddish-yellow tip, including most of the fourth segment, extending forward in the middle almost to the front edge of the segment; one pair discal bristles on second and third segments, fourth with numerous erect bristles over most of its surface. Genitalia small, black; a large flat lobe on each side yellow.

Legs black; middle tibia with two large bristles on outer front side; pulvilli elongated, the front ones considerably longer than last tarsal joint.

Wings subhyaline, bend of fourth vein with a small stump, beyond which the vein is not transverse, but gradually narrows the first posterior cell, which is open far before the wing tip.

Length, 10 mm.

Described from two males collected at Angol, Chile, by D. S. Bullock, April 9 and March 29, 1925.

Type.—Cat. No. 28903, U.S.N.M.

The species differs from the genotype of *Cuphocera* in having still smaller palpi, ocellar bristles, and discal abdominal bristles. The striking golden color of the face and bucca, the contrasting color of the basal and apical part of the antennae, and the striking yellow tip of the abdomen make it easily recognizable.

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CYMBIDIUM, A NEW GENUS OF SILURIAN PENTAMEROID BRACHIOPODS FROM ALASKA

By Edwin Kirk
Of the United States Geological Survey

In the paleontologic collections made in Southeastern Alaska the upper Silurian pentameroid brachiopods have proved of special interest. Typical *Conchidium* is abundant at various horizons, but of the remaining pentameroids all have been found to represent new genera. I have already described two of these genera—*Brooksina* and *Harpidium*. In the present paper I shall describe another genus *Cymbidium*. Of the pentameroids at present ascribed to *Conchidium* there are one or two aberrant types which it may not be possible to place under that genus and for which it may be necessary to create new generic names. The unusual number of new genera, particularly in such a widely distributed group as the pentameroids, is surprising. It is necessary to bear in mind, however, that we are dealing with a boreal fauna which is inadequately known. Furthermore, all these new forms occur at a stratigraphic horizon scarcely known in areas where extensive paleontologic collections have been made in the past.

In addition to their biologic interest these pentameroids, owing to their diverse forms and considerable differentiation, have proved of the utmost value in stratigraphic correlations. It is mainly for their use in stratigraphic studies that the forms are being described. It is to be hoped that more extensive collections of these upper Silurian faunas will be made that will permit an adequate treatment of the faunas as a whole.

The faunal sequence in Southeastern Alaska is closely similar to that of England. The lowest Silurian series of which we can be certain at present is characterized in part by graptolite-bearing slates and graywackes which probably correlate closely with the lower Ludlow. These are followed by a great sequence of clastics and thick limestones. In the limestone series the lowest fauna is characterized by a great abundance of *Conchidium* of the type of *knighti*, if indeed *knighti* itself may not be present. This horizon probably approxi-

mates closely to the Aymestry limestone of the middle Ludlow. In England the upper Ludlow and Downtonian apparently do not carry large normal marine faunas. In Alaska, however, these higher limestones are richly fossiliferous, and it is from them that these new pentameroid genera have been collected. In the interior of North America we can find a stratigraphically comparable fauna perhaps only in the Monroe group of Michigan. This group has been ascribed in part to the Devonian by some geologists. For the present it would appear that the Monroe should be retained in the Silurian. The so-called Devonian elements in the upper Monroe fauna are far from convincing. In the boreal upper Silurian are many fossils that judged by eastern American standards would be considered Devonian. It is indeed a matter of considerable difficulty at times accurately to separate upper Silurian and Middle Devonian faunas from Alaska when small collections of fossils are available. This applies particularly to the corals. Even in the case of crinoids, however, which are unusually diagnostic, I have found such European Devonian forms as *Hexacrinus* and *Codiacrinus* in the *Brooksina* zone of the upper Silurian of Southeastern Alaska. To be sure, dorsal cups alone represent these genera, and if complete specimens were available they might prove generically distinct from their Devonian relatives. Again, in the Ural Mountains we apparently have an admixture of Silurian and Devonian types. *Conchidium* is supposed to range upward into the Devonian. I think that here again we have to deal with boreal Silurian faunas, certain constituents of which are mainly known to us in eastern America and western Europe only in Devonian time. The solution of the problem will probably be had only when the boreal faunas are recognized as such, their sequence established, and their southward invasions recognized.

CYMBIDIUM, new genus

This genus is represented by two known species from the upper Silurian of Southeastern Alaska. *Cymbidium acutum*, new species, which has been chosen as the type, is fairly abundant in the limestones to the east of Edna Bay, on the south shore of Kosciusko Island. In a couple of hours' collecting one specimen with both valves preserved and a dozen or more dissociated valves were found. Near this locality and from a lower horizon, associated with *Brooksina alaskensis* Kirk, another species was found.

Superficially *Cymbidium*, though clearly a pentameroid, strongly suggests the general habit of an orthoid. In the type species the valves are almost equally convex, though the produced beak of the pedicle valve makes this the larger. The shell is wider than long, and the hinge line is about one-half the maximum breadth of the shell. In size *Cymbidium* falls with *Gypidula* and the allied genera.

The surface of the valves is marked by strong plications that multiply by simple dichotomy. There are also fine wavy concentric growth lines. The shell substance is fibrous, the fibers being intricately twisted and contorted.

The pedicle valve is smoothly convex or flattened and has a broad, slightly elevated median fold. The beak is somewhat everted and shows slight tendency toward incurving. The delthyrium is large and when freed from the matrix the shallow spondylium is clearly seen. Bordering the delthyrium are narrow deltidial plates.

The spondylium is attached to the inner borders of the delthyrium, but so far as it has been possible to ascertain from sections it is not supported by a septum at any point. In this feature the genus differs from all other known pentameroids. It may be that in very early growth stages the spondylium is adherent to the inner surface of the pedicle valve or that a septum is present. If so, this condition obtained only in the extreme posterior portion of the valve, and the most careful sectioning has failed to show it.

The brachial valve has a broad shallow median sinus corresponding to the fold of the pedicle valve. Its apical portion is strongly incurved. The septa of the brachial valve are low, short, widely separated, and strongly divergent. They are inclined toward one another and bear inclined crural processes. In the figure given the processes have some adherent matter that somewhat obscures their exact outline in part.

There is no known pentameroid that closely approaches *Cymbidium* in structure. Superficially the form suggests a somewhat aberrant *Conchidium*, and as noted above it also suggests an orthoid in its general habit. Internally the spondylium of the pedicle valve most nearly resembles that of *Barrandella*, which is likewise free for the greater part of its length, and also has an incipient septum that does not reach the valve. The septa and crural processes of the brachial valve are not essentially different from those of *Conchidium* except for their shortness and wide divergence.

This genus so far is known only in the upper Silurian limestones of Southeastern Alaska.

Genotype.—Cymbidium acutum, new species.

CYMBIDIUM ACUTUM, new species

The only specimen preserving both valves has a small part of one side broken off, so exact measurements of width can not be given. This specimen has an approximate maximum width of 33 mm., a maximum height of 28 mm., and a maximum depth of 20 mm. The hinge line is approximately 22 mm. in length. The valves are almost equally convex, although the brachial valve is somewhat more so.

The pedicle valve with its projecting beak is, however, the larger. The maximum breadth falls in the anterior half of the valves.

The pedicle valve has a broad slightly elevated median fold that is scarcely to be detected except in an anterior view of the shell. The valve is deepest in its median anterior portion. From this median line the shell carries around the beak, breaking abruptly toward the delthyrium and forming a well defined but narrow, smooth cardinal area. The beak is acute, everted, and shows but a slight tendency towards incurving. The delthyrium is triangular in outline and is proportionately large. It is bordered on both sides by narrow deltidial plates, which rest in shallow grooves. The spondylium is attached to the inner margins of the delthyrium and then carries forward and dorsad into the brachial valve, where its free margins come in contact with the inner surfaces of the crural processes that are supported by the septa of the brachial valve. So far as seen the spondylium receives its sole support from the fusion of its posterior margins with the inner border of the delthyrium. Sections in the extreme apical portion of the valve show a secondary thickening of the valves and a filling of lime that would completely hide a union of septum and valve, if such were ever present, which seems doubtful anyway. The spondylium is known to be free and without sign of a septum within two millimeters of the tip of the valve.

The brachial valve has a broad shallow sinus, corresponding to the fold of the pedicle valve. The valve is deepest and most convex in its posterior portion. The apical portion is strongly incurved. The septa of the brachial valve are low and short, probably not having a length exceeding 8 mm. in the type specimen. They diverge sharply and widely from their points of inception. In section the septa are shown to be inclined toward one another. Supported by the septa are narrow inclined crural plates.

The shell substance is fibrous, the fibers running and twisting in all directions. The surface ornamentation consists of coarse plications and fine concentric growth lines. The plications are most pronounced in the median portion of the valves, becoming lower laterally and finally dying out near the delthyrium and hinge line. The plications increase by regular dichotomy.

This species is fairly abundant in the dark crystalline upper Silurian limestones northeast of Edna Bay on the south shore of Kosciusko Island, Southeastern Alaska. Collector, Edwin Kirk.

Holotype and paratypes.—Cat. No. 71036, U.S.N.M.

CYMBIDIUM RETRORSUM, new species

At a stratigraphically lower horizon and near the type locality of *Cymbidium acutum* a second species of the genus was found. Two

complete individuals were collected, one of which was sectioned for the study of internal structures.

The type specimen has a maximum width of 31 mm., maximum height of 25 mm., and a maximum depth of 18 mm. The hinge line has an approximate length of 23 mm. The ornamentation consists of fairly coarse longitudinal plications.

The pedicle valve is convex in cross section but nearly straight in longitudinal section. The result is to make this valve relatively small and to give the species a reversed appearance, closely simulating the genus *Brooksina* with which the form is associated. The beak is low, blunt, and everted. The delthyrium is short but unusually broad. The spondylium is shallow, as may be seen in the figure. The delthyrium is bordered by narrow deltidial plates. The cardinal areas are abruptly cut off from the remainder of the valve and are almost flat. There is but a slight indication of a broad median fold, and this is apparent only on the anterior margin.

The grachial valve is uniformly convex. The beak is not prominent but is strongly incurved. The anterior margin of the valve is slightly sinuous, giving an indication of the presence of a median depressed area that scarcely shows on the surface of the valve, however.

The brachial valve is uniformly convex. The beak is not promithe slight development of a sinus and fold on the brachial and pedicle valves, its flattened pedicle valve, and the less elevated, everted beak of the pedicle valve.

The species was found associated with *Brooksina alaskensis* Kirk at its type locality about one-fourth mile inland and about 3 miles northeast of Edna Bay on the south side of Kosciusko Island, Southeastern Alaska. Collector, Edwin Kirk.

Holotype.—Cat. No. 71037, U.S.N.M.

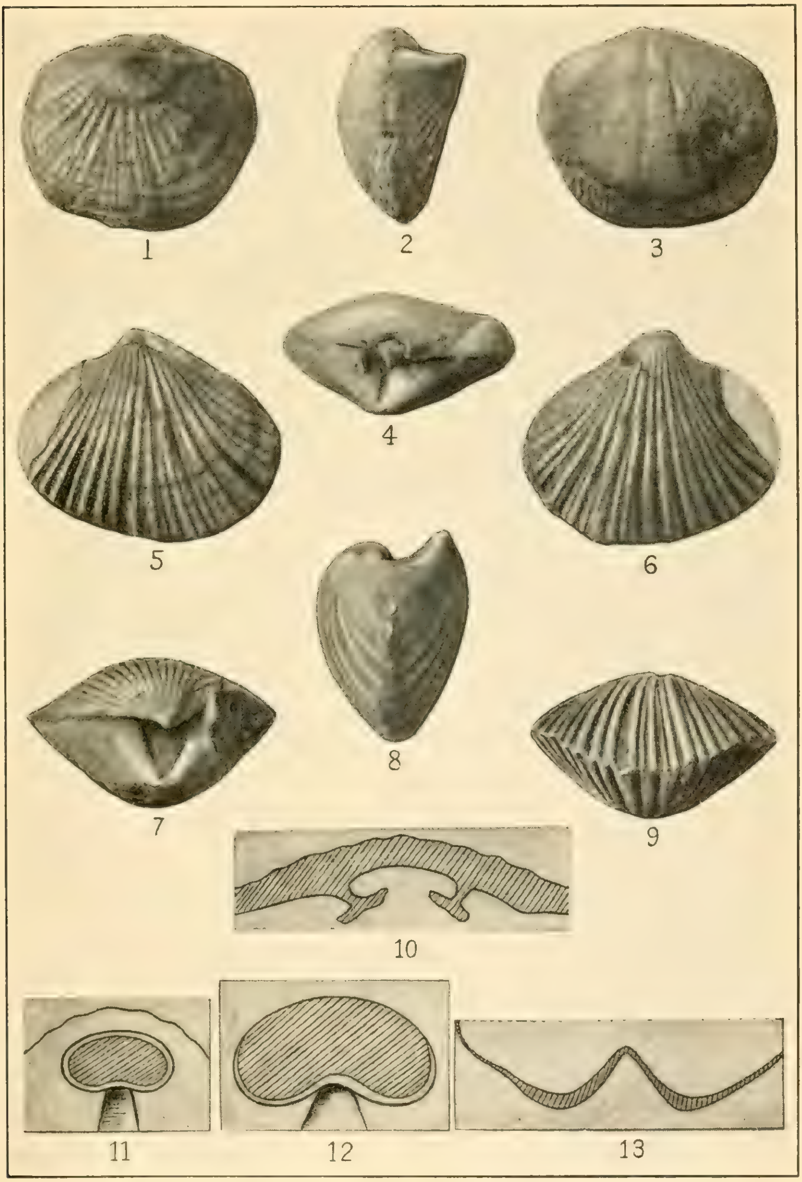
EXPLANATION OF PLATE

FIGS. 1–4. *Cymbidium retrorsum*, new species. Ventral, profile, dorsal, and posterior views of the type specimen.

5–9. *Cymbidium acutum*, new species. Dorsal, ventral, posterior, profile, and anterior views of the type specimen.

10–13. *Cymbidium acutum*, new species.

10. Section of brachial valve showing septa and inclined crural processes. The latter are somewhat thickened and obscured by secondary deposits. x 3.
11. Section of pedicle valve near the apex, showing the shallow unsupported spondylium. x 3.
12. Section of pedicle valve anterior to fig. 11. x 3.
13. Section of pedicle valve still farther forward. x 3.



NEW PENTAMEROID BRACHIOPODS FROM ALASKA

FOR EXPLANATION OF PLATE SEE PAGE 5